



Guide for the Selection of Personal Protective Equipment for Emergency First Responders

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We also wish to acknowledge the InterAgency Board (IAB) for Equipment Standardization and Interoperability and the Responder Knowledge Base (RKB). The IAB (made up of government and first responder representatives) was established to ensure equipment standardization and interoperability and to oversee the research and development of advanced technologies to assist first responders at the State and local levels in establishing and maintaining a robust crisis and consequence management capability. The RKB, supported under Award Number MIPT106-113-2000-002, Project Responder, from the National Memorial Institute for the Prevention of Terrorism (MIPT) and the Office of Grants and Training, Preparedness Directorate, U.S. Department of Homeland Security, has been built specifically to serve the needs of emergency responders. The RKB contains information on currently available products, along with related information such as standards, training, and grants.

We also sincerely thank all vendors who provided us with information about their products.

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DISCLAIMER: Reference in this guide to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not constitute or imply the endorsement, recommendation, or favoring by the U.S. Department of Homeland Security, or any agency thereof. The views and opinions contained in this guide are those of the authors and do not necessarily reflect those of the U.S. Department of Homeland Security or any agency thereof.

FOREWORD:

The U.S. Department of Homeland Security, Office of the Secretary, Preparedness Directorate Office of Grants and Training (G&T) Systems Support Division (SSD) develops and implements preparedness and prevention programs to enhance the capability of Federal, state and local governments, and the private sector to prevent, deter and respond to terrorist incidents involving chemical, biological, radiological, nuclear, and explosive (CBRNE) devices. The Preparedness Directorate Office of G&T administers comprehensive programs of direct and grant support for training, exercises, equipment acquisition, technology transfer, and technical assistance to enhance the nation's preparedness for CBRNE acts of terrorism. The Preparedness Directorate Office of G&T SSD works closely with other ODP divisions and Homeland Security professionals gaining an intimate understanding of the emergency responder technology needs and shortfalls. In addition, SSD conducts commercial technology assessments and demonstrations, and transfers equipment directly to the emergency responders. As part of the Congressional FY-03 funding, SSD was tasked with developing CBRNE technology guides and standards for the emergency responder community. This is one of several guides that will aid emergency responders in the selection of CBRNE technology.

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COMMONLY USED SYMBOLS AND ABBREVIATIONS

A	ampere	hf	high frequency	oz	ounce
ac	alternating current	Hz	hertz	o.d.	outside diameter
AM	amplitude modulation	i.d.	inside diameter	Ω	ohm
cd	candela	in	inch	p.	page
cm	centimeter	IR	infrared	Pa	pascal
CP	chemically pure	J	joule	pe	probable error
c/s	cycle per second	L	lambert	pp.	pages
d	day	L	liter	ppb	parts per billion
dB	decibel	lb	pound	ppm	parts per million
dc	direct current	lbf	pound-force	qt	quart
°C	degree Celsius	lbf·in	pound-force inch	rad	radian
°F	degree Fahrenheit	lm	lumen	rf	radio frequency
dia	diameter	ln	logarithm (base e)	rh	relative humidity
emf	electromotive force	log	logarithm (base 10)	s	second
eq	equation	M	molar	SD	standard deviation
F	farad	m	meter	sec.	Section
fc	footcandle	μ	micron	SWR	standing wave ratio
fig.	Figure	min	minute	uhf	ultrahigh frequency
FM	frequency modulation	mm	millimeter	UV	ultraviolet
ft	foot	mph	miles per hour	V	volt
ft/s	foot per second	m/s	meter per second	vhf	very high frequency
g	acceleration	mo	month	W	watt
gal	gallon	N	newton	λ	wavelength
g	gram	N·m	newton meter	wk	week
gr	grain	nm	nanometer	wt	weight
H	henry	No.	number	yr	year
h	hour				

area=unit² (e.g., ft², in², etc.); volume=unit³ (e.g., ft³, m³, etc.)

PREFIXES (See ASTM E380)

d	deci (10 ⁻¹)	da	deka (10)
c	centi (10 ⁻²)	h	hecto (10 ²)
m	milli (10 ⁻³)	k	kilo (10 ³)
μ	micro (10 ⁻⁶)	M	mega (10 ⁶)
n	nano (10 ⁻⁹)	G	giga (10 ⁹)
p	pico (10 ⁻¹²)	T	tera (10 ¹²)

Temperature: T °C = (T °F - 32) × 5/9

COMMON CONVERSIONS

0.30480 m = 1ft	4.448222 N = lbf
2.54 cm = 1 in	1.355818 J = 1 ft·lbf
0.4535924 kg = 1 lb	0.1129848 N m = 1 lbf·in
0.06479891g = 1gr	14.59390 N/m = 1 lbf/ft
0.9463529 L = 1 qt	6894.757 Pa = 1 lbf/in ²
3600000 J = 1 kW·hr	1.609344 km/h = mph

Temperature: T °F = (T °C × 9/5) + 32

ACRONYMS SPECIFIC TO THIS DOCUMENT

AEGL	Acute exposure guideline level	MUC	Maximum use concentration
ANSI	American National Standards Institute	NFPA	National Fire Protection Association
APER	Air-purifying escape respirators	NIJ	National Institute of Justice
APF	Assigned protection factor	NIOSH	National Institute for Occupational Safety and Health
APR	Air-purifying respirator	NIST	National Institute of Standards and Technology
ASTM	American Society for Testing and Materials	NATO	North Atlantic Treaty Organization
BA	Biological agent	NBC	Nuclear, biological, and chemical
BW	Biological warfare	NPPTL	National Personal Protective Technology Laboratory
CA	Chemical agent	NTSB	National Transportation Safety Board
CB	Chemical, biological	OSHA	Occupational Safety and Health Administration
CBRN	Chemical, biological, radiological, and nuclear	PAPR	Powered air-purifying respirator
CBT	Chemical /Biological protection	PASS	Personal alert safety system

CBW	Chemical biological warfare	MIST	Man in simulant test
CDC	Centers for Disease Control and Prevention	PEL	Permissible exposure limit (OSHA)
CEL	Certified equipment list	PF	Protection factor
CP	Chemical protective	PICS	Personal Ice cooling system
CBO	Collective protective overgarment	POL	Petroleum, oils, and lubricants
CPU	Collective protective undergarment	PPE	Personal protective equipment
CRUL	CBRN respirator use life	PPV	Positive pressure ventilation
CW	Chemical warfare	PVC	Polyvinyl chloride
CWC	Chemical Weapons Convention	RDECOM	U.S. Army Research, Development, and Engineering Command (formerly SBCCOM)
DOD	Department of Defense	REL	Recommended exposure limit (NIOSH)
DTAPS	Disposable toxicological agent protective suit	RIC/UAC	Rapid intervention crew/universal airline coupling
DPG	Dugway Proving Grounds	RIT	Rapid intervention team
DRES	Defense Research Establishment Suffield	RKB	Responder Knowledge Base
DTIC	Department of Defense Technical Information Center	SAR	Supplied air respirators
ECBC	Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD	SBCCOM	U.S. Army Soldier and Biological Chemical Command (now RDECOM)
EOD	Explosive ordnance disposal	SCBA	Self-contained breathing apparatus
EOST	End-of-service-time	SCFM	Standard cubic feet per minute
EPA	Environmental Protection Agency	SEI	Safety equipment institute
FBI	Federal Bureau of Investigation	SLGP	Secretary, Office of State and Local Government Coordination & Preparedness
FOV	Field of view	SME	Subject matter expert
FR	Fire resistant	SSD	Systems Support Division
HAZMAT	Hazardous materials	STB	Super tropical bleach
HEPA	High efficiency particulate air	TAP	Toxicological agent protective
HEROES	Homeland Emergency Response Operational and Equipment Systems	TC	Testing certification
HUD	Heads-up display	TDP	Technical data package
IAFF	International Association of Fire Fighters	TICs	Toxic industrial chemicals
IDLH	Immediately dangerous to life and health	TIMs	Toxic industrial materials
IAB	Interagency Board	TOP	Test operating procedure
ITAR	International Traffic and Arms Regulations	TRA	Test Representative Agent
LDV	Lung demand valve	TSWG	Technical Support Working Group
LOP	Level of protection	UI	User instructions (respirator operations manual)
LPS	Liquid/splash protection	UL	Underwriters Laboratories, Inc.
MCC	Microclimate cooling	VAS	Voice amplification system
MIBK	Methylisobutylketone	VPU	Voice projection unit
MEK	Methylethylketone	VPS	Vapor protection

ABOUT THIS GUIDE

The Preparedness Directorate's Office of Grants and Training (G&T) Systems Support Division (SSD) of the U.S. Department of Homeland Security (DHS) is the focal point for providing support to State and local law enforcement agencies in the development of counterterrorism technology and standards, including technology needs for CBRNE defense. In recognizing the needs of State and local emergency first responders, the Office of Law Enforcement Standards (OLES) at the National Institute of Standards and Technology (NIST), supported by the U.S. Department of Homeland Security (DHS), the Technical Support Working Group (TSWG), the U.S. Army Edgewood Chemical and Biological Center (ECBC), the National Fire Protection Association (NFPA), the National Institute of Occupational Safety and Health (NIOSH), and the Interagency Board for Equipment Standardization and Interoperability (IAB), has developed CBRNE defense equipment guides. The guides focus on CBRNE equipment in areas of detection, personal protection, decontamination, and communication. This document is an update of the *Guide for the Selection of Personal Protective Equipment for Emergency First Responders* (DHS Guide 102-00) published in November 2002 and was developed to assist the emergency first responder community in the evaluation and purchase of CBRN personal protection equipment (PPE).

The long range plans continue to include the following goals: (1) subject existing PPE to laboratory testing and evaluation against a specified protocol, and (2) conduct research leading to the development of a series of documents, including national standards, user guides, and technical reports. It is anticipated that the testing, evaluation, and research processes will take several years to complete; therefore, DHS will continue to maintain this guide for the emergency first responder community in order to facilitate their evaluation and purchase of PPE.

In conjunction with this program, additional published guides and other documents, including CBRNE detection equipment, decontamination equipment, and communications equipment used in conjunction with protective clothing and respiratory equipment, will be periodically updated.

The information contained in this guide has been obtained through literature searches and market surveys. The vendors were contacted multiple times during the preparation of this guide to ensure data accuracy. In addition, the information is supplemented with test data obtained from other sources (e.g., Department of Defense) if available. It should also be noted that the purpose of this guide is not to provide recommendations but rather to serve as a means to provide information to the reader to compare and contrast commercially available PPE.

Technical comments, suggestions, and product updates are encouraged from interested parties. They may be addressed to the Office of Law Enforcement Standards, National Institute of Standards and Technology, 100 Bureau Drive, Stop 8102, Gaithersburg, MD 20899-8102. It is anticipated that this guide will continue to be updated periodically.

Questions relating to the specific personal protective items included in this document should be addressed directly to the proponent agencies or the equipment manufacturer.

GUIDE FOR THE SELECTION OF PERSONAL PROTECTIVE EQUIPMENT FOR EMERGENCY FIRST RESPONDERS

This second edition guide includes information intended to be useful to the emergency first responder community in the selection of (PPE) for different applications. It includes an updated market survey of chemical, biological, radiological, and nuclear (CBRN) PPE known to the authors as of March 2006. Those wanting additional information can obtain it from the extensive list of references included in appendix A. Additional information for each equipment item can be found in the corresponding data sheets in the appendices.

1. INTRODUCTION

The primary purpose of the *Guide for the Selection of Personal Protective Equipment for Emergency First Responders* is to provide emergency first responders with information to aid them in the selection of PPE, both percutaneous (skin) protection and respiratory protection. PPE providing percutaneous protection addressed in this guide includes protective ensembles, footwear, and gloves. PPE providing respiratory protection from CBRN threats addressed in this guide includes air-purifying respirators (APRs), powered air-purifying respirators (PAPRs), self-contained atmosphere supplying respirators (SCBAs), and escape respirators. The guide is intended to be more practical than technical and provides information on a variety of factors that should be considered when purchasing and using PPE, including duration of protection, dexterity/mobility (how cumbersome is the equipment), cleanability, and use/reuse, to name a few.

The remainder of this guide is divided into several sections. Section 2 presents background information about the function, components, protection levels, and certification standards associated with PPE. Section 3 provides an introduction to chemical agents, toxic industrial chemicals/materials (TICs/TIMs), biological agents, and radiological/nuclear agents. Specifically, it discusses CBRN agents by providing overviews, physical and chemical properties, routes of entry, and symptoms. It also discusses the 98 TICs/TIMs that are considered in this guide. Section 4 presents an overview of percutaneous protection and is divided into several subsections that focus on ensembles, boot, and gloves. Section 5 presents an overview of respiratory protection equipment and is divided into several subsections that focus on APRs, PAPRs, SCBAs, and escape respirators. Each equipment subsection within section 4 and section 5 is self-contained and includes an overview of the equipment, characteristics and performance parameters (referred to as selection factors in the remainder of the guide) that are used to evaluate the equipment, and the equipment evaluation results. The selection factors were compiled by a panel of experienced scientists and engineers with multiple years of experience with PPE, domestic preparedness, and identification of emergency first responder needs. The factors have also been shared with the emergency responder community in order to obtain their thoughts and comments. The final section in the guide, section 6, provides an overview of microclimate cooling (MCC) technologies and currently available equipment that could be used with the PPE discussed in this guide.

Seventeen appendices are included within this guide. Appendix A lists the documents that are referenced in the guide. Appendix B provides the immediately dangerous to life and health (IDLH) values for the chemical agents and most of the TIMs that are listed. Appendix C provides the ensemble data fields, and appendix D provides an index of the ensembles along with the ensemble data sheets. Appendix E provides a listing of ensembles that were not evaluated for this report. Appendix F provides the protective footwear data fields, and appendix G provides an index of the protective footwear along with the protective footwear data sheets. Appendix H provides the protective gloves data fields, and appendix I provides an index of the protective gloves along with the protective gloves data sheets. Appendix J provides the APR data fields, and appendix K provides an index of the APRs along with the APR data sheets. Appendix L provides the PAPR data fields, and appendix M provides an index of the PAPRs along with the PAPR data sheets. Appendix N provides the SCBA data fields, and appendix O provides an index of the SCBAs along with the SCBA data sheets. Appendix P provides the escape respirator data fields, and appendix Q provides an index of the escape respirators along with the escape respirator data sheets.

2. PERSONAL PROTECTIVE EQUIPMENT

The intent of this section is to provide background information about the function of PPE, the components of PPE, and the levels of protection. Section 2.1 discusses the purpose of PPE, section 2.2 presents the components of PPE, and section 2.3 discusses the NFPA and NIOSH CBRN standards associated with PPE.

2.1 Purpose of Personal Protective Equipment

Personal protective equipment is designed to shield or isolate individuals from the CBRN hazards that may be encountered during hazardous materials operations. This group of hazards is applicable in the NIOSH respirator performance standards, and the term CBRN has, and is being, incorporated into many of the National Fire Protection Association (NFPA) protective ensemble standards. During an emergency response, it is not always apparent when exposure occurs. Many toxic materials pose invisible hazards and offer no warning properties.

PPE must be worn whenever the wearer faces potential hazards arising from exposure to CBRN hazards. Many activities associated with emergency operations that may require the wearing of PPE are presented below.

- **Site Survey:** Individuals conducting an initial investigation of a hazardous materials incident/accident site. These situations are usually characterized by a large degree of uncertainty and mandate the highest levels of protection.
- **Emergency Rescue:** Individuals entering a hazardous materials area for the purpose of removing an exposure victim. Special considerations must be given to how the selected protective clothing may affect the ability of the wearer to carry out rescue operations.
- **Hazard Mitigation:** Individuals entering a hazardous materials area to prevent a potential toxic release or to reduce the hazards from an existing release. Protective clothing must accommodate the required tasks without sacrificing adequate protection.
- **Monitoring/Supervision:** Individuals entering a hazardous materials area for the explicit purpose of observing and directing work operations or preventing unnecessary safety risks.
- **Decontamination:** Individuals providing decontamination support to personnel or equipment leaving the contaminated site.

No single combination of protective equipment and clothing is capable of protecting against all hazards. Thus, PPE should always be used in conjunction with other protective methods. For example, proper decontamination and engineering or administrative controls should always be employed as additional measures for preventing exposure.

2.2 Components of Personal Protective Equipment

Personal protective equipment is designed to provide protection from CBRN vapors, gases, liquids, particulates, and aerosol threats encountered during hazardous materials emergency incidents. Personal protective equipment includes percutaneous protection, i.e., protective ensembles (suits or coveralls), footwear, and gloves; and respiratory protection, i.e., APR, PAPR, SCBA, and escape respirators. The PPE components and elements should be designed, certified, and deployed as a “system” providing full body protection. This is particularly important when the respirator is exposed to the hazard environment and provides dermal as well as inhalation protection. This systems approach assures that component interfaces, seams, and closures are designed and tested as a complete system. Percutaneous equipment is discussed in depth in section 4, and respiratory protection equipment is discussed in section 5.

2.2.1 Percutaneous Protection

Percutaneous protection provides skin protection from harmful physical or chemical exposure as a result of a CBRN incident. Terms associated with percutaneous protection are defined in the remainder of this section.

2.2.1.1 Ensembles

Complete percutaneous protection, or ensemble, consists of a protective garment (i.e., suit/coverall), footwear, gloves, and respiratory equipment.

2.2.1.2 Protective Garments

Protective garments sometimes referred to as coveralls but more commonly referred to as protective suits, are the basic unit of overall body protection. These garments come in a myriad of configurations, depending on the requirements of the overall protective ensemble. Protective garments may be completely encapsulating and include an attached hood, visor, gloves, and booties. Other coveralls may have separate and/or attached hoods, separate and/or attached gloves, and/or separate and/or attached booties, or a combination of hood, gloves, or booties. However, a certified ensemble must be certified with specific component elements.

2.2.1.3 Protective Footwear

Protective footwear, also referred to as protective boots, provides foot protection, either complete CBRN protection on its own or additional chemical barrier protection as an overboot. Boots are a component of a protective ensemble and can be purchased with the ensemble or purchased separately. It is important to note that some standards may require specific boots be worn with certified ensembles.

2.2.1.4 Protective Gloves

Protective gloves provide hand protection and can include inner gloves and outer gloves, as well as sleeves. Gloves are a component of a protective ensemble, either attached to the garment or

purchased separately. Either way, if gloves are used with a certified ensemble, the gloves must be certified as part of the ensemble. It is important to note that some standards do require specific gloves be worn with certified ensembles.

2.2.2 Respiratory Protection

Personal respiratory protection systems, or respirators, provide the protection the first responders require by preventing the inhalation of harmful airborne substances and/or an oxygen-deficient atmosphere. Respiratory protection is provided by APRs, PAPRs, SCBA, and/or escape respirators. Each type of respirator has specific uses and limitations and should not be substituted for another. Supplied air respirators, such as an SCBA, should be used in an unknown or above IDLH hazard environments. Air filtering respirators, such as an APR or PAPR, should only be used when the hazard has been identified and is below the IDLH value. These types are explained in more detail in the rest of this section.

2.2.2.1 Air-Purifying Respirator

Air-purifying respirators contain a filter, cartridge, or canister that removes specific air contaminants by filtering, adsorbing, absorbing, or chemical reaction with the contaminants as they pass through the respirator canister or cartridge. Since APRs do not supply oxygen, they must only be used when the surrounding atmosphere contains sufficient oxygen (19.5 % to 23.5 % by volume) to sustain life, and the air contaminant level is below the concentration limits of the APR.

2.2.2.2 Powered-Air Purifying Respirator

A PAPR is an APR that uses battery power and a blower to force ambient atmosphere through air purifying elements (filter) to an inlet covering. The components of a PAPR include a respiratory facepiece; a helmet, hood, or blouse; a blower unit with a blower to draw air into the unit through the air inlet and to deliver air to the air outlet; a holder to contain the blower unit; a detachable filter cartridge connected to the air inlet of the blower unit; and a detachable breathing tube connected at one end to the air outlet of the blower unit and connected at the other end to the respiratory mask.

2.2.2.3 Self-Contained Breathing Apparatus

An atmosphere supplying respirator provides clean breathing air from an uncontaminated source, independent of the surrounding atmosphere rather than removing contaminants from the atmosphere. A SCBA is an open-circuit atmosphere-supplying respirator that provides breathing air from a cylinder of very pure, dry compressed air, which is held in a frame that is worn on the back.

2.2.2.4 Escape Respirators

Escape respirators, escape hoods, or escape masks are designed to protect against breathing harmful gases, vapors, fumes, and dusts for a limited amount of time in an emergency situation.

Escape respirators can be designed as an air-purifying escape respirator (APER) or a SCBA type respirator. The SCBA type escape respirator has a hood that provides a barrier against contaminated outside air and an attached source of breathing air. The APER has a filter canister mounted on the hood to filter out harmful contaminants before the air is breathed.

2.3 NIOSH and NFPA CBRN PPE Standards

It is important for responders to realize that selecting items based only on how they are designed or configured (OSHA/EPA Protection Levels) is not sufficient to ensure adequate protection. In other words, just having the right components to form an ensemble is not enough; the first responder must also consider the performance capability of the PPE. Performance capabilities associated with protective ensembles, are addressed via NFPA Performance and Certification Standards. Performance capabilities associated with APRs, SCBAs, and escape respirators are addressed through NIOSH CBRN Respirator Standards. The CBRN PAPR standard is still under development by NIOSH. A brief description of the EPA Protection Levels is presented in section 2.3.1, the NFPA Performance and Certification Standards are presented in section 2.3.2, and the NIOSH CBRN Standards are addressed in section 2.3.3.

2.3.1 EPA Protection Levels

The U.S. Environmental Protection Agency (EPA) levels of protection, as applicable to individuals involved in handling hazardous materials, are based on the type of respiratory protection required to ensure the safety of the user under the specified conditions of use. The levels of protection direct which protective ensemble the user should wear to ensure adequate protection, as well as describe what the recommended protective ensemble should consist of and look like, but not necessarily how the various components should perform. NFPA standards specify actual performance criteria for the protective clothing that might be recommended under a level of protection (LOP).³ The EPA descriptions for the widely used EPA Levels of Protection (i.e., Levels A, B, C, and D) are described in 29 CFR 1910.120, appendix B.

2.3.2 NFPA Performance and Certification Standards

This section provides an overview of the three NFPA Performance and Certification Standards that address chemical and biological protective footwear, gloves, and ensembles. The NFPA 1991 (2005 Edition) and the NFPA 1992 (2005 Edition) are discussed in section 2.3.2.1; the NFPA 1994 (2001 Edition) is addressed in section 2.3.2.2.

2.3.2.1 NFPA 1991 and 1992 Standards (2005 Editions)

NFPA 1991 and 1992 were first written in the late 1980s in response to the growing number of hazardous material responders who were using chemical protective clothing from a variety of sources with inconsistent protection. In 1985, after several first responders were exposed to a hazardous chemical from a leaking railcar, the National Transportation Safety Board (NTSB)

³ http://www2.dupont.com/Personal_Protection/en_US/tech_info/epaguidelines.html

recommended that government agencies support the development of protective standards for chemical protection. As a result of these efforts, NFPA 1991 and NFPA 1992 standards were developed to correspond to the EPA Level A and B designations that are common in the hazardous chemical response and remediation industries.

The NFPA 1991 Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies (2005 Edition) describes an ensemble that includes a suit with attached gloves that totally encapsulates the wearer and his or her breathing apparatus. To meet the requirements of the standard, the suit/gloves may also be worn with an over cover, outer gloves, and outer boots. The NFPA 1991 (2005 Edition) includes mandatory testing and certification for CAs. The NFPA 1991 (2005 Edition) standard includes the following changes from the NFPA 1991 (2001 Edition):⁴

- Optional requirements for CA and BA threats are now mandatory for all vapor protective ensembles compliant with NFPA 1991.
- Optional requirements for limited protection for escape only in the event of chemical flash fire, and optional requirements for protection from liquefied gas are provided.
- Refined test methods to improve clarity, consistency, and repeatability are available.
- Refined text to provide clearer criteria is available.

The NFPA 1992 Standard on Liquid Splash-Protective Clothing for Hazardous Materials Emergencies (2000 Edition) contains a base set of performance requirements and an enhanced performance option for chemical flash fire escape protection. The ensembles are for situations where the primary form of chemical exposure is short-term contact with liquid chemicals that are not toxic to the skin and no carcinogenic vapors, i.e., no chemical vapor hazards exist during a hazardous material response. NFPA 1992 contains few design requirements, and the performance characteristics are similar to those specified in NFPA 1991. In addition, penetration testing, not permeation testing, is used to evaluate barrier performance in NFPA 1992. The NFPA 1992 standard has no BA or CA requirements because these requirements are addressed in NFPA 1994 and NFPA 1991 (2005 Edition) Standards.

In 2005, revisions were made to both the NFPA 1991 (2000 Edition) and the NFPA 1992 (2000 Edition) standards that resulted in the NFPA 1991 (2005 Edition) and the NFPA 1992 (2005 Edition) standards. The NFPA 1991 (2005 Edition) and the NFPA 1992 (2005 Edition) standards now include new requirements for manufacturer's quality assurance programs and for situations where hazards involving compliant products are believed to exist, including appropriate actions in addressing these situations if there is a previously unknown threat to the user. All labeling, design, performance, and testing requirements have been reviewed and refined as necessary.⁵

The NFPA 1992 Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies (2005 Edition) adds the optional criteria for chemical flash fire protection for escape only.

⁴ NFPA 1991 has been adopted by the U.S. Department of Homeland Security (DHS).

⁵ <http://www.seinet.org/news/aug05.pdf>

2.3.2.2 NFPA 1994 Standard

The National Fire Protection Association (NFPA) 1994 Standard on Protective Ensembles for Chemical/Biological Terrorism Incidents, 2001 Edition was released in August 2001 to specifically set performance requirements for protective clothing used in response to CBRN terrorism incidents. NFPA 1994 (2001 Edition) defines three specific classes of protective ensembles (Class 1, 2, and 3) to be used in response operations such as assessment, extrication, rescue, triage, and treatment operations involving CBRN threats. It is unique in that it defines the three classes of ensembles based on the perceived threat at the emergency scene. Specific details associated with ensembles to include garments, footwear, and gloves are discussed in section 4.

The NFPA 1994 (2007 Edition) revised standard was finalized with an effective date of August 2006. The new title is NFPA 1994 Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents, 2007 Edition. The new edition establishes minimum performance requirements for CBRN protective ensembles for emergency first responder personnel responding to incidents involving CBRN terrorism agents, to include; assessment, extrication, rescue, triage, decontamination, treatment, site security, crowd management, and force protection operations. The most noticeable changes include the following.⁶

- Transfers the requirements of the former 1994 Class 1 fully encapsulated ensemble to *NFPA 1991: Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies, 2005 Edition*, where the highest level of vapor protection is covered. This type of ensemble is more likely to be used by specialized response teams that have the resources and training for correct use.
- Realigns the criteria for the Class 2 ensemble for hazard environments requiring the use of a CBRN SCBA and the Class 3 ensemble for hazard environments requiring the use of a CBRN APR/PAPR, and adds a new Class 4 ensemble that provides limited protection to first responders to CBRN terrorism incidents involving biological hazards or radiological particulate hazards and requires the use of a CBRN APR/PAPR.
- Requires that Class 3 and Class 4 ensemble materials meet minimum performance requirements for a total heat loss (THL) test that may require the use of more breathable materials to reduce heat stress to emergency responders, such as law enforcement personnel who might use these ensembles over a longer duration in low challenge exposures and non-IDLH atmospheres.

It must be noted that for ensembles already certified to NFPA 1994 (2001 Edition), the certification will remain in effect for the shelf-life of the ensemble. In addition, the standard is being grandfathered in, i.e., the vendors are allowed to distribute and sell NFPA 1994 (2001 Edition) certified ensembles through February 2007, after which they may no longer be sold as a certified ensemble.

⁶ <http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=1994&cookie%5Ftest=1>

2.3.3 NIOSH CBRN Standards⁷

In April 2000, NIOSH entered into a Memorandum of Understanding with NIST, the Occupational Safety and Health Administration (OSHA), and NFPA to jointly work on developing standards for all types of counterterrorism equipment. NIOSH and NIST initiated Interagency Agreements with the U.S. Army Soldier and Biological Chemical Command (SBCCOM) for development of respiratory protection standards, test procedures, and laboratory support.⁸

As of May 2006, NIOSH has released three CBRN standards: the SCBA standard (for use in unknown or above IDLH concentrations of contaminant over short durations of use), the APR standard (for use in known concentrations of contaminant or below IDLH concentrations over longer durations), and the escape respirator standards for APER and Self-Contained Escape Respirators (SCER). The NIOSH CBRN Standard for PAPRs is currently being developed.

The Code of Federal Regulations (CFR) is the codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government. It is divided into 50 titles that represent broad areas subject to Federal regulation. Each volume of the CFR is updated once each calendar year and is issued on a quarterly basis.⁹ The approval of respiratory protective devices is contained in Title 42: Public Health, Chapter I: Public Health Service, Department of Health and Human Services Part 84 (Approval of Respiratory Protective Devices). Title 42 is divided into subparts, and the subparts are further divided into applicable paragraphs that apply to each type of respiratory protection. The 16 subparts are presented in the following list:

- Subpart A—General Provisions.
- Subpart B—Application for Approval.
- Subpart C—Fees.
- Subpart D—Approval and Disapproval.
- Subpart E—Quality Control.
- Subpart F—Classification of Approved Respirators.
- Subpart G—General Construction and Performance.
- Subpart H—Self-Contained Breathing Apparatus.
- Subpart I—Gas Masks.
- Subpart J—Supplied-Air Respirators.
- Subpart K—Non-Powered Air-Purifying Particulate Respirators.
- Subpart L—Chemical Cartridge Respirators.
- Subpart M—[Reserved].
- Subpart N—Special Use Respirators.
- Subparts O–JJ—[Reserved].
- Subpart KK—Dust, Fume, and Mist; Pesticide; Paint Spray; Powered Air-Purifying High Efficiency Respirators and Combination Gas Masks.

⁷ <http://www.cdc.gov/niosh/npptl/guidancedocs/interapr070805.html>

⁸ <http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/ltr-122801.html>

⁹ <http://www.gpoaccess.gov/cfr/index.html>

3. INTRODUCTION TO THE CBRN THREATS

The purpose of this section is to provide a description of CBRN threats. Section 3.1 provides a discussion of CAs, section 3.2 provides a discussion of TICs/TIMs, section 3.3 provides a discussion of BAs, and section 3.4 provides a discussion of radiological/nuclear materials.

3.1 Chemical Agents

Chemical agents are chemical substances that are intended for use in warfare or terrorist activities to kill, seriously injure, or seriously incapacitate people through their physiological effects. A CA attacks the organs of the human body in such a way that it prevents those organs from functioning normally. The results are usually disabling or even fatal. Chemical agents are specifically identified in the Chemical Weapons Convention (CWC) list to separate them from TICs/TIMs.

Chemical agents, when referred to in this guide, indicate nerve and blister agents only. The most common CAs are the nerve agents, GA (tabun), GB (sarin), GD (soman), GF (cyclosarin), and VX; and the blister agents, H and HD (sulfur mustards), HN (nitrogen mustard) and the arsenical vesicant L (lewisite). Other toxic chemicals such as hydrogen cyanide (characterized as a chemical blood agent by the military) are included as TIMs under section 3.2 of this guide. Toxic chemicals derived from living organisms are generically termed toxins and are included under section 3.5 of this guide.

3.1.1 Nerve Agents

This section provides an overview of nerve agents. A discussion of their physical and chemical properties, their routes of entry, and descriptions of symptoms is also provided.

3.1.1.1 Overview

Among lethal CAs, blister agents dominated World War I and nerve agents have had a dominant role since World War II. Nerve agents acquired their name because they affect the transmission of impulses in the nervous system. All nerve agents belong to the chemical group of organophosphorus compounds; many common herbicides and pesticides also belong to this chemical group. Nerve agents are stable, easily dispersed, highly toxic, and have rapid effects when absorbed both through the skin and the respiratory system. Nerve agents can be manufactured by means of fairly simple chemical techniques. The raw materials are inexpensive but some are subject to the controls of the CWC and the Australia Group Agreement. The nerve agents considered in this guide include the following:

- GB: A volatile nonpersistent CA mainly taken up through inhalation as a gas or aerosol.
- GA: A low volatility persistent CA that is taken up through skin contact and inhalation of the substance either as a gas or aerosol.
- GD: A moderately volatile CA that can be taken up by skin contact or through inhalation as a gas or aerosol.

- GF: A low volatility persistent CA that is taken up through skin contact and inhalation of the substance either as a gas or aerosol.
- VX: A low volatility persistent CA that can remain on material, equipment, and terrain for long periods. Uptake is mainly through the skin but also through inhalation of the substance as a gas or aerosol.

The term “volatility” refers to a substance’s ability to become a vapor at relatively low temperatures.

3.1.1.2 Physical and Chemical Properties

Nerve agents in the pure state are colorless liquids; however, VX may have a slight yellow color. Volatilities of nerve agents vary widely. A highly volatile (nonpersistent) substance poses a greater respiratory hazard than a less volatile (persistent) substance. The consistency of VX may be likened to motor oil and is therefore classified as belonging to the group of persistent CAs. Its effect is mainly through direct contact with the skin. GB is at the opposite extreme; being an easily volatile liquid (comparable with, e.g., water), it is mainly taken up through the respiratory organs. The volatilities of GD, GA, and GF are between those of GB and VX. Table 3–1 lists the common nerve agents and some of their physical and chemical properties. Water is included in the table as a reference point for the nerve agents.

Table 3–1. Physical and chemical properties of common nerve agents

Property	GB	GA	GD	GF	VX	Water
Molecular weight	140.1	162.3	182.2	180.2	267.4	18
Density, g/cm ³ *	1.089	1.073	1.022	1.120	1.008	1
Boiling point, °F	316	464	388	462	568	212
Melting point, °F	-69	18	-44	-22	<-60	32
Vapor pressure, Mm Hg *	2.9	0.07	0.4	0.06	0.0007	23.756
Volatility, mg/m ³ *	22000	610	3900	600	10.5	23010
Solubility in water, % *	Miscible with water	10	2	~2	Slightly	NA

*at 77 °F

NA: not applicable

3.1.1.3 Route of Entry

Nerve agents, either as a gas, aerosol, or liquid, enter the body through inhalation or through the skin. Poisoning may also occur through consumption of liquids or foods contaminated with nerve agents.

The route of entry also influences the symptoms developed and, to some extent, the sequence of symptom onset. Generally, the poisoning works most rapidly when the agent is absorbed through the respiratory system rather than other routes because the lungs contain numerous blood vessels; the inhaled nerve agent quickly diffuses into the blood and quickly reaches the target

organs. If a person is exposed to a high concentration of nerve agent, e.g., 200 mg sarin/m³, death may occur within a couple of minutes.

The poisoning works more slowly when the agent is absorbed through the skin. Since nerve agents are somewhat fat-soluble, they can easily penetrate the outer layers of the skin, but it takes longer for the poison to reach the deeper blood vessels. Consequently, the first symptoms do not occur until 20 min to 30 min after the initial exposure but subsequently, the poisoning process may be rapid if the total dose of nerve agent is high.

3.1.1.4 Symptoms

When exposed to a low dose of nerve agent sufficient to cause minor poisoning, the victim experiences characteristic symptoms such as increased production of saliva, a runny nose, and a feeling of pressure on the chest. The pupil of the eye becomes contracted (miosis), which impairs night vision. In addition, the capacity of the eye to change focal length is reduced, and short-range vision deteriorates causing the victim to feel pain when trying to focus on nearby objects. This is accompanied by a headache. Less specific symptoms are fatigue, slurred speech, hallucinations, and nausea.

Exposure to a moderate dose leads to more dramatic developments, and symptoms are more pronounced. Bronchoconstriction and secretion of mucus in the respiratory system lead to difficulty in breathing and to coughing. Discomfort in the gastrointestinal tract may develop into cramping and vomiting, and there may be involuntary discharge of urine and feces. There may be excessive salivating, tearing, and sweating. If the poisoning is moderate, typical symptoms affecting the skeletal muscles may be muscular weakness, local tremors, or convulsions.

When exposed to a high dose of nerve agent, the muscular symptoms are more pronounced, and the victim may suffer convulsions and lose consciousness. The poisoning process may be so rapid that symptoms mentioned earlier may never have time to develop.

Nerve agents affect the respiratory muscles causing muscular paralysis. Nerve agents also affect the respiratory center of the central nervous system. The combination of these two effects is the direct cause of death. Consequently, death caused by nerve agents is similar to death by suffocation.

3.1.2 Blister Agents (Vesicants)

Blister agents, also known as vesicants, are chemicals that cause severe skin, eye, and mucosal pain and irritation. They are so named because of their ability to cause vesicular skin lesions. This section provides an overview of blister agents, including a discussion of their physical and chemical properties, their routes of entry, and descriptions of their symptoms. Given the similarity of their physiological effects, the traditional blister agents and the arsenical vesicants are discussed together in this section.

3.1.2.1 Overview

There are two major families of blister agents: mustards agents [nitrogen mustards (HN-1, HN-2, and HN-3), sulfur mustards (H, HD, and HT), and mustard–lewisite (HL)], and the arsenical vesicant lewisite (L). All blister agents are persistent and may be employed in the form of colorless gases and liquids. They burn and blister the skin or any other part of the body they contact. Blister agents are likely to be used to produce casualties rather than to kill, although exposure to such agents can be fatal. Supportive care for blister agent casualties is often manpower and logistically intensive.

3.1.2.2 Physical and Chemical Properties

Mustard agents are oily liquids ranging from colorless (in pure state) to pale yellow to dark brown, depending on the type and purity. They have a faint odor of mustard, onion, garlic, or horseradish, but because of olfactory fatigue, odor cannot be relied on for detection.¹⁰ In addition, mustard agent can cause injury to the respiratory system in such low concentrations that that the human sense of smell cannot distinguish them.

At room temperature, mustard agent is a liquid with low volatility and is very stable during storage. Mustard agent can be easily dissolved in most organic solvents but has negligible solubility in water. In aqueous solutions, mustard agent decomposes into nonpoisonous products by means of hydrolysis but since only dissolved mustard agent reacts, the decomposition proceeds very slowly. Oxidants such as chloramines, however, react rapidly with mustard agent, forming nonpoisonous oxidation products. Consequently, these substances are used for the decontamination of mustard agent.

Organic arsenical vesicants are not as common or as stable as the sulfur or nitrogen mustards. All arsenical vesicants are colorless to brown liquids. They are more volatile than mustard and have fruity to geranium-like odors. These types of vesicants are much more dangerous as liquids than as vapors. Absorption of either vapor or liquid through the skin in adequate dosage may lead to systemic intoxication or death. The physical and chemical properties of the most common blister agents are listed in table 3–2. Water is included in the table as a reference point for the blister agents.

¹⁰ <http://www.emedicine.com/emerg/topic901.htm>

Table 3–2. Physical and chemical properties of common blister agents

Property	HD	HN-1	HN-2	HN-3	L	Water
Molecular weight	159.1	170.1	156.1	204.5	207.4	18
Density, g/cm ³	1.27 at 68 °F	1.09 at 77 °F	1.15 at 68 °F	1.24 at 77 °F	1.89 at 68 °F	1 at 77 °F
Boiling point, °F	421	381	167 at 15 mm Hg	493	374	212
Freezing point, °F	58	-61.2	-85	-26.7	64.4 to 32.18	32
Vapor pressure, Mm Hg	0.072 at 68 °F	0.24 at 77 °F	0.29 at 68 °F	0.0109 at 77 °F	0.394 at 68 °F	23.756 at 77 °F
Volatility, mg/m ³	610 at 68 °F	1520 at 68 °F	3580 at 77 °F	121 at 77 °F	4480 at 68 °F	23010 at 77 °F
Solubility in water, %	<1 %	Sparingly	Sparingly	Insoluble	Insoluble	NA

NA: not applicable

3.1.2.3 Route of Entry

Most blister agents are relatively persistent and are readily absorbed by all parts of the body. Poisoning may also occur through consumption of liquids or foods contaminated with blister agents. These agents cause inflammation, blisters, and general destruction of tissues. In the form of gas or liquid, mustard agent attacks the skin, eyes, lungs, and gastrointestinal tract. Internal organs, mainly blood-generating organs (i.e., bone marrow, spleen, and lymphatic tissue), may also be injured as a result of mustard agent being taken up through the skin or lungs and transported into the body. Since mustard agent gives no immediate symptoms upon contact, a delay of between 2 h and 24 h may occur before pain is felt and the victim becomes aware of what has happened. By then, cell damage has already occurred. The delayed effect is a characteristic of mustard agent.

3.1.2.4 Symptoms

In general, both liquid and vaporous vesicants can penetrate the skin. The latent period for the effects from mustard is usually several hours (the onset of symptoms from vapors is 4 h to 6 h and the onset of symptoms from skin exposure is 2 h to 48 h). There is no latent period for exposure to lewisite.

Mild symptoms of mustard agent poisoning may include aching eyes with excessive tearing, inflammation of the skin, irritation of the mucous membranes, hoarseness, coughing, and sneezing. Normally, these injuries do not require medical treatment.

Severe injuries that are incapacitating and require medical care may involve eye injuries with loss of sight, the formation of blisters on the skin, nausea, vomiting, and diarrhea together with severe difficulty in breathing. Severe damage to the eye may lead to the total loss of vision.

The most pronounced effects on inner organs are injury to the bone marrow, spleen, and lymphatic tissue. This may cause a drastic reduction in the number of white blood cells 5 d to

10 d after exposure; a condition very similar to that after exposure to radiation. This reduction of the immune defense will complicate the already large risk of infection in people with severe skin and lung injuries.

The most common cause of death as a result of mustard agent poisoning is complications after lung injury caused by inhalation of mustard agent. Most of the chronic and late effects from mustard agent poisoning are also caused by lung injuries.

3.2 Toxic Industrial Chemicals/Toxic Industrial Materials

This section provides a general overview of TICs/TIMs as well as a list of the specific TICs/TIMs considered in this guide. Since the chemistry of TICs/TIMs is so varied, it is not feasible to discuss specific routes of entry and descriptions of symptoms. Several documents, including *2004 Emergency Response Guidebook, A Guidebook for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Incident*, published November 2004, provide more detailed information about TICs/TIMs (see app. A).

TICs/TIMs are chemicals and materials other than CAs that have harmful effects on humans. TICs/TIMs are found in a variety of settings such as manufacturing facilities, maintenance areas, and general storage areas. While acute exposure to some of these chemicals may not be immediately dangerous, these compounds may have extremely serious effects on an individual's health after multiple low-level exposures.

3.2.1 General

A TIC is a *specific type* of industrial chemical, i.e., one that has a LCt_{50} value (lethal concentration of a chemical vapor or aerosol for 50 % of the population multiplied by exposure time) less than $100\,000\text{ mg min/m}^3$ in any mammalian species and is produced in quantities exceeding 30 tons per year at one production facility. Although they are not as lethal as the highly toxic nerve agents, their ability to make a significant impact on the populace is assumed to be more related to the amount of chemical a terrorist can employ on the target(s) and less related to their lethality. None of these compounds are as highly toxic as the nerve agents, but they are produced in very large quantities (multi-ton) and are readily available; therefore, they may pose a far greater threat than CAs. For instance, sulfuric acid is not as lethal as the nerve agents, but it is easier to acquire and disseminate large quantities of sulfuric acid because large amounts of it are manufactured and transported everyday. It is assumed that a balance is struck between the lethality of a material and the amount of materials produced worldwide. TIMs include materials such as chemical, biological, and radioactive waste from industrial processes that can pose hazards to individuals.

Since TICs/TIMs are less lethal than the CAs, it is difficult to determine how to rank their potential for use by a terrorist. Physical and chemical properties for TICs such as ammonia, chlorine, cyanogen chloride, and hydrogen cyanide are presented in table 3–3. Water is included in the table as a reference point for the TICs. The physical and chemical properties for the remaining TICs identified in this guide can be found in *International Task Force 25: Hazard From Industrial Chemicals Final Report, April 1998* (see app. A).

Table 3–3. Physical and chemical properties of TICs

Property	Ammonia	Chlorine	Cyanogen Chloride	Hydrogen Cyanide	Water
Molecular weight	17.03	70.9	61.48	27.02	18
Density, g/cm ³	0.682 at 68 °F	3.214 at 77 °F	1.18 at 68 °F	0.990 at 68 °F	1 at 77 °F
Boiling point, °F	-28	-30	55	78	212
Freezing point, °F	-108	-150	20	8	32
Vapor pressure, Mm Hg at 77 °F	7408	5643	1000	742	23.756
Volatility, mg/m ³	6782064 at 77 °F	21508124 at 77 °F	2600000 at 68 °F	1080000 at 77 °F	23010 at 77 °F
Solubility in water, %	89.9	1.5	Slightly	Highly soluble	NA

NA: not applicable

3.2.2 TIC Rankings

TICs are ranked into one of three categories that indicate their relative importance and assist in hazard assessment. Table 3–4 lists the TICs with respect to their hazard index ranking (high, medium, or low hazard).¹¹ In addition, blood and choking agents are noted by single or double asterisks, respectively.

3.2.2.1 High Hazard

High hazard indicates a widely produced, stored, or transported TIC that has high toxicity and is easily vaporized.

3.2.2.2 Medium Hazard

Medium hazard indicates a TIC, which may rank high in some categories but lower in others such as number of producers, physical state, or toxicity.

3.2.2.3 Low Hazard

A low hazard overall ranking indicates that this TIC is not likely to be a hazard unless specific operational factors indicate otherwise.

3.2.2.4 Blood Agents

A blood agent is a TIC, which typically includes the cyanide group, affecting bodily functions by preventing the normal utilization of oxygen by body tissues. The term "blood agent" is a misnomer, however, because these agents do not actually affect the blood in any way. Rather, they exert their toxic effect at the cellular level by interrupting the electron transport chain in the inner membranes of mitochondria.

⁴Summary of the Final Report of the International Task Force 25 Hazard from Industrial Chemicals, 15 April 1999.

3.2.2.5 Choking Agents

A choking agent (or pulmonary agent) is a TIC designed to impede a victim's ability to breathe, resulting in suffocation. Choking agents were preferred in WWI but have lost much of their tactical destructive utility since the invention of nerve agents. Choking agents are lethal and are very easily obtained.

Table 3–4. TICs listed by hazard index

High	Medium	Low
Ammonia**	Acetone cyanohydrin	Allyl isothiocyanate
Arsine*	Acrolein	Arsenic trichloride
Boron trichloride	Acrylonitrile	Bromine**
Boron trifluoride	Allyl alcohol	Bromine chloride
Carbon disulfide	Allylamine	Bromine pentafluoride
Chlorine**	Allyl chlorocarbonate	Bromine trifluoride
Diborane	Boron tribromide	Carbonyl fluoride
Ethylene oxide	Carbon monoxide*	Chlorine pentafluoride
Fluorine	Carbonyl sulfide	Chlorine trifluoride
Formaldehyde	Chloroacetone	Chloroacetaldehyde
Hydrogen bromide	Chloroacetonitrile	Chloroacetyl chloride
Hydrogen chloride**	Chlorosulfonic acid	Crotonaldehyde
Hydrogen cyanide*	Diketene	Cyanogen chloride*
Hydrogen fluoride	1,2-Dimethylhydrazine	Dimethyl sulfate
Hydrogen sulfide	Ethylene dibromide	Diphenylmethane-4,4'-diisocyanate
Nitric acid, fuming	Hydrogen selenide	Ethyl chloroformate
Phosgene**	Methanesulfonyl chloride	Ethyl chlorothioformate
Phosphorus trichloride	Methyl bromide**	Ethyl phosphonothioic dichloride
Sulfur dioxide	Methyl chloroformate	Ethyl phosphonic dichloride
Sulfuric acid	Methyl chlorosilane	Ethyleneimine
Tungsten hexafluoride	Methyl hydrazine	Hexachlorocyclopentadiene
	Methyl isocyanate**	Hydrogen iodide
	Methyl mercaptan	Iron pentacarbonyl
	Nitrogen dioxide	Isobutyl chloroformate
	Phosphine**	Isopropyl chloroformate
	Phosphorus oxychloride	Isopropyl isocyanate
	Phosphorus pentafluoride	n-Butyl chloroformate
	Selenium hexafluoride	n-Butyl isocyanate
	Silicon tetrafluoride	Nitric oxide
	Stibine	n-Propyl chloroformate
	Sulfur trioxide	Parathion
	Sulfuryl chloride	Perchloromethyl mercaptan
	Sulfuryl fluoride**	sec-Butyl chloroformate
	Tellurium hexafluoride	tert-Butyl isocyanate
	n-Octyl mercaptan	Tetraethyl lead
	Titanium tetrachloride	Tetraethyl pyrophosphate
	Trichloroacetyl chloride	Tetramethyl lead
	Trifluoroacetyl chloride	Toluene 2,4-diisocyanate
		Toluene 2,6-diisocyanate

* Blood agent

** Choking agent

3.3 Biological Agents

This section provides a description of the types, or grouping, of BAs likely to be used in a terrorist attack. There are three important classes of BAs under discussion: bacterial (including rickettsiae), viral, and biological toxins.

3.3.1 Bacterial Agents

Bacteria are small, single-celled organisms, many of which can be grown on solid or liquid culture media. During starvation conditions, some types of bacteria can transform into spores that are more resistant to cold, heat, drying, chemicals, and radiation than the bacterium itself. Most bacteria do not cause disease in human beings, but those that do cause disease act by two differing mechanisms, i.e., by invading the tissues or by producing poisons (toxins). Many bacteria, such as *Bacillus anthracis*, have properties that make them attractive as potential warfare agents:

- Retained potency during growth and processing to the end product (biological weapon).
- Long “shelf-life.”
- Low biological decay as an aerosol.

Other bacteria require stabilizers to improve their potential for use as biological weapons.

Rickettsiae are bacteria that are obligate intracellular parasites associated with arthropods vectors including insects (fleas and lice) and arachnids (ticks and mites). They are intermediate in size, between most bacteria and viruses, and possess certain characteristics common to both bacteria and viruses. Like bacteria, they have metabolic enzymes and cell membranes, use oxygen, and are susceptible to broad-spectrum antibiotics; like viruses, they grow only in living cells. Most rickettsiae are spread by the bites of arthropod vectors and are not spread through human contact.

Table 3–5 lists some of the common bacterial agents along with possible methods of dissemination, incubation period, symptoms, and treatment.

Table 3–5. Bacterial agents

Biological Agent	<i>Bacillus anthracis</i>	<i>Burcella abortus, B. melitensis, B. suis, B. canis</i>	<i>Escherichia coli</i> serotype (O157:H7)	<i>Francisella tularenius</i>
	Disease	Anthrax	Brucellosis	Diarrhea, hemolytic uremic syndrome
Likely Method of Dissemination	1. Spores in aerosol 2. Sabotage (food) 3. Cutaneous—contact with contaminated animal product	1. Aerosol 2. Sabotage (food)	1. Water 2. Food supply contamination	1. Aerosol 2. Water and food supply contamination 3. Ticks
Transmissible Person-to-Person	No	Rare	Unknown, evidence passed person-to-person in day-care or nursing homes	No
Incubation Period	1 d to \geq 43 d	1 wk to 3 wk, sometimes months	Unknown	2 d to 10 d
Duration of Illness	3 d to 5 d (usually fatal)	Unknown	5 d to 10 d (most cases)	>2 wk
Fatality Rate	Inhalation anthrax: after symptoms appear, almost always fatal, regardless of treatment Intestinal: 25 % to 60 % fatality rate Contact or cutaneous anthrax: 5 % to 20 % fatality rate	Low	Up to 15 % if develop hemolytic uremic syndrome (HUS); 5 % if develop thrombotic thrombocytopenic purpura (TTP)	In general, tularemia has a slower progression of illness and a lower case-fatality rate than anthrax; between 1985 and 1992, 1409 cases and 20 deaths were reported in the U.S., a case fatality rate of 1.4 %
Vaccine Efficacy (for aerosol exposure)/ Antitoxin	Currently no human data; however, the anthrax attack of 2001 showed that anthrax could be successfully treated	Vaccine under evaluation	No vaccine	No commercially available vaccine
Symptoms and Effects	<u>Inhalation</u> : Flu-like, upper-respiratory distress; fever and shock in 3 d to 5 d, followed by death <u>Intestinal</u> : nausea, loss of appetite, vomiting, and fever are followed by abdominal pain, vomiting of blood, and severe diarrhea <u>Cutaneous</u> : Ulcer with black necrotic center, followed by swollen lymph glands	Irregular prolonged fever, profuse sweating, chills, joint and muscle pain, persistent fatigue	Gastrointestinal (diarrhea, vomiting) dehydration; in severe cases, cardiac arrest and death, HUS, or TTP	<u>Aerosol exposure</u> : chills, sustained fever, prostration, tendency for pneumonia, enlarged, painful lymph nodes, headache, malaise, anorexia, nonproductive cough <u>Cutaneous</u> : ulcers on the skin or mouth, swollen and painful lymph glands, swollen and painful eyes, and a sore throat
Treatment	Antibiotics approved for anthrax are ciprofloxacin, tetracyclines (including doxycycline), and penicillins; if exposed to anthrax, but symptom free, 60 d treatment with one of the antibiotics is given to reduce the risk or progression of disease due to inhaled anthrax	Antibiotics	Antibiotics available; most recover without antibiotics within 5 d to 10 d; do not use antidiarrheal agents	Antibiotics: parenteral antimicrobial therapy recommended A vaccine for tularemia is under review but is not currently available in the U.S.
Potential as Biological Agent	High, Iraqi and USSR biological programs worked to develop anthrax as a bio-weapon	Unknown	Unknown	High, if delivered via aerosol form (highly infectious, 90 % to 100 %)

Table 3–5. Bacterial agents–Continued

Biological Agent	<i>Vibrio cholerae</i>	<i>Burkholderia mallei</i>	<i>Pseudomonas pseudomallei</i>	<i>Yersinia pestis</i>	<i>Salmonella typhi</i>
Disease	Cholera	Glanders	Melioidosis	Plague (pneumonic and bubonic)	Typhoid fever
Likely Method of Dissemination	1. Sabotage (food and water)	1. Aerosol 2. Cutaneous	1. Food contamination (rodent feces) 2. Inhalation	1. Aerosol (pneumonic) 2. Infected fleas (Bubonic and Pneumonic)	1. Contact with infected person 2. Contact with contaminated substances
Transmissible Person-to-Person	Rare	No	No	High (pneumonic)	High
Incubation Period	3 d to 5 d	3 d to 5 d	Days	1 d to 3 d	7 d to 14 d
Duration of Illness	>1 wk	Unknown	4 d to 20 d	1 d to 6 d (usually fatal)	Unknown
Fatality Rate	Low with fluid replacement	50 % to 70 %	Although bloodstream infection with melioidosis can be fatal, the other types of the disease are nonfatal	5 % to 10 % if treated Bubonic: 30 % to 75 % if untreated Pneumonic: 95 % if untreated	<1 % if treated; 10 % to 14 % if untreated
Vaccine Efficacy (for aerosol exposure)/ Antitoxin	No data on aerosol	No vaccine	No vaccine	Vaccine not available	Oral vaccine (Vivotif) and single dose injectable vaccine (capsular polysaccharide antigen); both vaccines are equally effective and offer 65 % to 75 % protection against the disease
Symptoms and Effects	Sudden onset with nausea, vomiting, diarrhea, rapid dehydration, toxemia, and collapse	Skin lesions, ulcers in skin, mucous membranes, and viscera; if inhaled, upper respiratory tract involvement	Cough, fever, chills, muscle/joint pain, nausea, and vomiting; progressing to death	Enlarged lymph nodes in groin; septicemia (spleen, lungs, meninges affected)	Prolonged fever, lymph tissue involvement, ulceration of intestines, enlargement of spleen, rose-colored spots on skin, constipation or diarrhea
Treatment	Replenish fluids and electrolytes; a prepackaged oral rehydration solution (a mixture of sugar and salts to be dissolved in water) is available	Drug therapy (streptomycin and sulfadiazine) is somewhat effective	Antibiotics (doxycycline, chlorothenicol, tetracycline) and sulfadiazine	Antibiotics: streptomycin, or gentamicin if streptomycin not available, tetracyclines and chloramphenicol can be used	Antibiotics (amoxicillin or cotrimoxazole) shorten period of communicability and cure disease rapidly
Potential as Biological Agent	Not appropriate for aerosol delivery	Unknown	Moderate—no vaccine available	High—highly infectious, particularly pneumonic (aerosol) form; lack of stability and loss of virulence complicate its use	Not likely to be deployed via aerosol; more likely for covert contamination of water or food

Table 3–6 lists the common rickettsiae, along with possible methods of dissemination, incubation periods, symptoms, and treatment.

Table 3–6. Rickettsiae

Biological Agent or Source	<i>Rickettsia typhus</i>	<i>Rickettsia prowazekii</i>	<i>Coxiella burnetii</i> (<i>Rickettsia burnetii</i>)	<i>Rickettsia rickettsii</i>
Disease	Endemic Typhus	Epidemic Typhus	Q Fever	Rocky Mountain Spotted Fever
Likely Method of Dissemination	Aerosol	Aerosol	1. Sabotage (food supply) 2. Aerosol	Aerosol
Transmissible Person-to-Person	No	No	Rare	No
Incubation Period	6 d to 14 d	6 d to 15 d	14 d to 26 d	3 d to 14 d
Duration of Illness	Unknown	Unknown	Weeks	Unknown
Fatality Rate	1 %, increasing in people >50 yr old	10 % to 40 % untreated; increases with age	Very low	15 % to 20 % untreated (higher in adults); treated—death rare with specific therapy (tetracycline or chloramphenicol)
Vaccine Efficacy (for aerosol exposure)/ Antitoxin	Unknown	Vaccine confers protection of uncertain duration	94 % protection against 3500 LD ₅₀ in guinea pigs	No vaccine
Symptoms and Effects	Sudden onset of headache, chills, prostration, fever, pain; maculae eruption on 5 th day to 6 th day on upper body, spreading to all but palms, soles, or face, but milder than epidemic form	Sudden onset of headache, chills, prostration, fever, pain; maculae eruption on 5 th day to 6 th day on upper body, spreading to all but palms, soles, or face	Mild symptoms (chills, headaches, fever, chest pains, perspiration, loss of appetite)	Fever and joint pain, muscular pain; skin rash that spreads rapidly from ankles and wrists to legs, arms, and chest; aversion to light
Treatment	Antibiotics (tetracycline and chloramphenicol); supportive treatment and prevention of secondary infections	Antibiotics (tetracycline and chloramphenicol); supportive treatment and prevention of secondary infections	Tetracycline (500 mg/ 6 h, 5 d to 7 d) or doxycycline (100 mg/ 12 h, 5 d to 7 d) also, combined erythromycin (500 mg/ 6 h) and rifampin (600 mg/d)	Antibiotics—tetracycline or chloramphenicol
Potential as Biological Agent	Uncertain—broad range of incubation (6 d to 14 d) period could cause infection of force deploying BA	Uncertain—broad range of incubation (6 d to 14 d) period could cause infection of force deploying BA	Highly infectious if delivered in aerosol form; dried agent is very stable; aerosol form is stable	Unknown

3.3.2 Viral Agents

Viruses are the simplest type of microorganism and consist of a nucleocapsid containing a protein coat containing genetic material, either RNA or DNA. Because viruses lack a system for their own metabolism, they require living hosts (cells of an infected organism) for replication and cannot be cultivated in synthetic nutritive solutions. However, host cells can be cultivated in synthetic nutrient solutions and then infected with a virus specific to the host cells. In addition,

viruses are much smaller in size than bacteria. As BAs, they are attractive because many do not respond to antibiotics. However, their incubation periods are normally longer than for other BAs, so incapacitation of victims may be delayed. Table 3–7 lists the viral agents of greatest concern, along with possible methods of dissemination, incubation period, symptoms, and treatment.

Table 3–7. Viral agents

Biological Agent or Source	Filovirus		Tacaribe Virus complex Arenavirus	Phlebovirus	Variola major, Orthopoxvirus
	Disease	Marburg Hemorrhagic Fever	Ebola Hemorrhagic Fever	Argentine Hemorrhagic Fever (Junin)	Rift Valley Fever
Likely Method of Dissemination	Aerosol	Direct contact Aerosol (BA)	Not known	Mosquito-borne; aerosols or droplets	Aerosol
Transmissible Person-to-Person	Moderate	Moderate	Moderate	Unknown	High
Incubation Period	5 d to 7 d	4 d to 16 d	7 d to 16 d	2 d to 5 d	7 d to 17 d
Duration of Illness	Unknown	Death between 7 d to 16 d	16 d	2 d to 5 d	4 wk
Fatality Rate	23 % to 25 %	50 % to 90 %	18 %	<1 %	20 % to 40 % (Variola major) <1 % (Variola minor)
Vaccine Efficacy (for aerosol exposure)/ Antitoxin	No vaccine	Experimental	No vaccine	Inactivated vaccine available in limited quantities	Vaccine protects against infection within 3 d to 5 d of exposure
Symptoms and Effects	Sudden onset of fever, malaise, muscle pain, headache, and conjunctivitis, followed by sore throat, vomiting, diarrhea, rash, and both internal and external bleeding (begins 5th day); liver function may be abnormal and platelet function may be impaired	Mild febrile illness, then vomiting, diarrhea, rash, kidney and liver failure, internal and external hemorrhage (begins 5 th day), and petechiae	Hemorrhagic syndrome, chills, sweating, exhaustion and stupor	Febrile illness, sometimes abdominal tenderness; rarely shock, ocular problems	Sudden onset of fever, headache, backache, vomiting, marked prostration, and delirium; small blisters form crusts which fall off 10 d to 40 d after first lesions appear
Treatment	No specific treatment exists; severe cases require intensive supportive care, as patients are frequently dehydrated and in need of intravenous fluids	No specific therapy; supportive therapy essential	No specific therapy; supportive therapy essential	No studies, but IV ribavirin (30 mg/ kg/6 h for 4 d, then 7.5 mg/kg/8 h for 6 d) should be affective	Vaccinia immune globulin (VIG) and supportive therapy
Potential as Biological Agent	High—weaponized by former Soviet Union biological program	Unknown—possibly weaponized by former Soviet Union	Unknown	Difficulties with mosquitos as vectors	Possible, especially since routine smallpox vaccination programs have been eliminated worldwide; weaponized by former Soviet Union

3–7. Viral agents–Continued

Biological Agent or Source	Flaviviruses		Nairovirus	Alphavirus
Disease	Yellow Fever Virus	Dengue Fever Virus (DEN-1, DEN-2, DEN-3, and DEN-4)	Congo-Crimean Hemorrhagic Fever Virus	Venezuelan Equine Encephalitis
Likely Method of Dissemination	Mosquito-borne Aerosol	Mosquito-borne (<i>Aedes aegypti</i>)	Insect vectors	Aerosol
Transmissible Person-to-Person	Low	No	Yes	No
Incubation Period	3 d to 6 d	3 d to 15 d	7 d to 12 d	1 d to 6 d
Duration of Illness	2 wk	1 wk	9 d to 12 d	Days to weeks
Fatality Rate	10 % to 20 % death in severe cases or full recovery after 2 d to 3 d	5 % average case fatality	15 % to 20 %	<1 %
Vaccine Efficacy (for aerosol exposure)/ Antitoxin	Vaccine available; confers immunity for >10 yr	Vaccine available	No vaccine available; prophylactic ribavirin may be effective	Experimental only: TC–83 protects against 30 LD ₅₀ to 500 LD ₅₀ in hamsters
Symptoms and Effects	Sudden onset of chills, fever, prostration, aches, muscular pain, congestion, severe gastrointestinal disturbances, liver damage and jaundice; hemorrhage from skin and gums	Sudden onset of fever, chills, intense headache, pain behind eyes, joint and muscle pain, exhaustion and prostration; occasionally produces shock and hemorrhage, leading to death	Fever, easy bleeding, petechiae, hypotension and shock; flushing of face and chest, edema, vomiting, diarrhea	Sudden illness with malaise, spiking fevers, rigors, severe headache, photophobia, and myalgias
Treatment	No specific treatment; supportive treatment (bed rest and fluids) for even the mildest cases	No specific therapy; supportive therapy essential	No specific treatment	Supportive treatments only, there is a vaccine for laboratory workers
Potential as Biological Agent	High, if efficient dissemination device is employed	Unknown	Unknown	High—former U.S. and U.S.S.R. offensive biological programs weaponized both liquid and dry forms for aerosol distribution

3.3.3 Biological Toxins

Biological toxins have very distinct characteristics that differentiate them from the CAs. Unlike CAs, biological toxins are not manmade or volatile; they are generally much more toxic per weight than CAs. With the exception of mycotoxins, biological toxins are not dermally active. Biological toxins can cause significant illness at concentrations much lower than the level

required for lethality. As a result, they are highly appealing as weapons of bioterrorism not only for their lethality, but also because of their ability to incapacitate humans. Table 3–8 lists the common biological toxins along with possible methods of dissemination, incubation period, symptoms, and treatment.

Table 3–8. Biological toxins

Biological Source	<i>Clostridium botulinum</i>	<i>Staphylococcus aureus</i>	Mycotoxins of the Trichothecene group	Isolated from Castor Beans	Marine Dinoflagellate
Toxin/Disease	Botulinum toxin—7 antigenically different botulinum toxins (A, B, C, D, E, F, and G); Types A, B, E, and F responsible for most human cases	Staphylococcal enterotoxin B (SEB)	T-2 mycotoxins (yellow rain)	Ricin	Saxitoxin
Likely Method of Dissemination	1. Aerosol 2. Sabotage (food and water)	1. Sabotage (food supply) 2. Aerosol	1. Aerosol 2. Sabotage	1. Aerosol 2. Sabotage (food & water)	In biological scenario, inhalation or toxic projectile
Transmissible Person-to-Person	No	No	No	No	No
Incubation Period	Variable (hours to days)	3 h to 12 h	2 h to 4 h	Hours to days	5 min to 1 h
Duration of Illness	Death in 24 h to 72 h; lasts months if not lethal	Hours	Days to months	Days—death within 10 d to 12 d for ingestion	Death in 2 h to 12 h
Fatality Rate	70 %, untreated <5 % treated	For aerosol exposures the ED ₅₀ is 0.0004 mcg/kg, and the LD ₅₀ is 0.02 mcg/kg	Moderate	100 %, without treatment LD ₅₀ , 30 mcg/kg (gastrointestinal) LD ₅₀ , 3 mcg/kg (aerosol) LD ₅₀ similar to aerosol (<u>parenteral</u>)	High without respiratory support
Vaccine Efficacy (for aerosol exposure)/ Antitoxin	Botulism antitoxin (IND) Prophylaxis toxoid (IND) Toxolide	No vaccine	No vaccine	No vaccine	No vaccine

Table 3–8. Biological toxins–Continued

Biological Source	<i>Clostridium botulinum</i>	<i>Staphylococcus aureus</i>	Mycotoxins of the Trichothecence group	Isolated from Castor Beans	Marine Dinoflagellate
Symptoms and Effects	Ptosis; weakness, dizziness, dry mouth and throat, blurred vision and diplopia, flaccid paralysis	Sudden chills, fever, headache, myalgia, nonproductive cough, nausea, vomiting, and diarrhea	n—pain, pruritis, redness and vesicles, sloughing of epidermis; respiratory—nose and throat pain, discharge, sneezing, coughing, chest pain, hemoptysis	<u>Aerosol</u> —Weakness, fever, cough, pulmonary edema, severe respiratory distress <u>Parenteral</u> —local necrosis of muscle and regional lymph nodes with organ involvement and death <u>Gastrointestinal</u> —severe gastroenteritis, GI hemorrhage, and hepatic, splenic, and renal necrosis; death may occur secondary to circulatory collapse	Light-headedness, tingling of extremities, visual disturbances, memory loss, respiratory distress, death
Treatment	Antitoxin with respiratory support (ventilation)	Pain relievers and cough suppressants for mild cases; for severe cases, may need mechanical breathing and fluid replenishment	No specific antidote or therapeutic regimen is available; supportive and symptomatic care	Oxygen, plus drugs to reduce inflammation and support cardiac and circulatory functions; if ingested, empty the stomach and intestines; replace lost fluids	Induce vomiting, provide respiratory care, including artificial respiration
Potential as Biological Agent	Not very toxic via aerosol route; extremely lethal if delivered orally	Moderate—could be used in food and limited amounts of water (for example, at salad bars); LD ₅₀ is sufficiently small to prevent detection	High—used in aerosol form (“yellow rain”) in Laos, Kampuchea and Afghanistan (through 1981)	Has been used in 1978—Markov murder (see app. B, ref. 7); included on prohibited Schedule I chemicals list for Chemical Weapons Convention; high potential for use in aerosol form	Moderate, aerosol form is highly toxic

3.4 Radiological/Nuclear Materials

Radiological materials are radioactive substances (i.e., substances that emit high-energy particles or gamma rays while undergoing radioactive decay). Nuclear materials are the key ingredients in nuclear weapons and include fissile, fissionable, and source material.

A radiological dispersion device (RDD) is a weapon that combines radioactive material and conventional explosives. It is designed to disperse radioactive material over a wide area; however, lethality from the conventional explosives is likely to be a more immediate hazard than injury from the radioactive material contained in the RDD. The purpose of the RDD is therefore

intended to seriously incapacitate and to cause disruption by psychologically and financially impacting the areas in or around the target. The ingredients needed to make an RDD are readily available and can be found in industry, medical facilities, and university laboratories, but they cannot be used for a device that will generate an explosive nuclear yield.

Nuclear weapons include the atomic bomb (nuclear fission), the hydrogen bomb (nuclear fusion), boosted fission weapons, and the neutron bomb. The atomic bomb is a fission reactor designed to release as much energy as possible in the shortest time possible, causing an explosion and stopping the chain reaction. The uncontrolled fission chain reaction has a thousand times more energy than any chemical explosive such as dynamite. The radiological materials used most often in nuclear weapons are concentrated forms of uranium-235 (the isotope of uranium with an atomic mass of 235) and plutonium-239.

3.4.1 Terminology

Some common terms used when discussing radiation or nuclear materials include radioactivity, radioactive decay, half-life, specific activity, and radiation energy.

- **Radioactivity** is the property of disintegrating spontaneously, with loss of energy through emission of a charged particle (electron, positron, or alpha particle) or a gamma ray or a neutron.
- **Radioactive decay** occurs when an energetically unstable nucleus transforms itself to a more energetically favorable, or stable, state. In the process of change, the unstable nucleus emits radiation in order to become more stable.
- **Half-life** is the amount of time required for a radiological material to lose one half of its radioactivity. Half-lives of radioactive materials differ from one to another and range from a fraction of a second to millions of years. Some radiological materials decay quickly into nonradioactive material.
- **Specific activity** of a radiological material is inversely proportional to its half-life, and is an indication of the decay rate per unit mass of the radiological material.
- **Radiation energy** is the energy carried by a radiated particle. It is released by the atom as it decays, i.e., the energy that the radiation carries as it travels. Radiation energy is measured in electron volts (eV).

3.4.2 Types of Radiation

Radiation is energy in the form of electromagnetic waves or charged particles. Electromagnetic waves of radiation include x-rays and gamma rays, and particulate radiation includes alpha, beta, and neutron radiation. Gamma rays and neutrons can penetrate the skin and reach internal organs and tissues. Alpha particles and all but extremely high-energy beta particles are not considered penetrating radiation. X-rays are similar to gamma rays but are only from manmade sources.

Alpha particles, beta particles, and gamma rays are considered ionizing radiation because they interact with nearby atoms as they travel through matter. Neutron particles are considered indirect ionizing radiation because ionization results from a collision between a neutron and the

nucleus of an atom. Radio waves, microwaves, visible light, and infrared rays from a heat lamp are sources of nonionizing radiation. Nonionizing radiation has lower energy and longer wavelengths than ionizing radiation. Although nonionizing radiation is not strong enough to affect the structure of atoms it contacts, it is strong enough to heat tissue and cause harmful biological effects. Alpha particles, beta particles, gamma/x-rays, and neutrons are discussed in the following sections.

3.4.2.1 Alpha Particles

Alpha particles are positively (+) charged particles emitted from the nucleus of an atom. They are relatively large and very heavy consisting of two protons and two neutrons, identical to the nucleus of a helium atom. Because of this strong positive charge and large mass, an alpha particle cannot penetrate far into any material and can be stopped by a sheet of paper or an inch of air, or by the dead layers of the skin or by a uniform. Inhalation of radioactive dust is a serious risk since particles may remain in the lung for a long time and are in close contact with living cells. Ingestion is also a serious threat, but the residence time in the body is usually shorter. Alpha particles are a negligible external hazard, but when emitted from an internalized radionuclide source, can cause significant cellular damage in the region immediately adjacent to their physical location.

3.4.2.2 Beta Particles

Beta particles are very light particles (about 2000 times less mass than a proton) with a mass and charge equal to that of an electron (-1) or a positron (+1). Because of their light mass and single charge, beta particles can penetrate more deeply than alpha particles. They can be stopped by a few millimeters of aluminum. Although beta particles only travel short distances into tissue, in large quantities they can produce damage to the basal stratum of the skin. The lesion produced by the beta particle, or “beta burn” appears similar to a thermal burn. Beta emitters are also more serious threats when inhaled or ingested due to longer potential exposure time and proximity to tissue. Beta particles are the most likely decay particle from lighter nuclei. The light nuclei may be produced in reactors from fission fragments or by neutron or particle beam irradiation of stable nuclei.

3.4.2.3 Gamma Rays

Gamma rays, similar to x-rays, are short wavelength uncharged radiation, wavelengths of electromagnetic radiation that are higher in frequency and energy than visible and ultraviolet light. They are emitted from the nucleus of an atom. Being electromagnetic (or photons), gamma/x-rays travel at the speed of light and have extremely high penetrating power. They can penetrate skin, paper, and thin metals but can be stopped by lead, concrete, or steel. Both gamma ray and x-ray radiation are considered an external hazard; they both have the ability to cause internal tissue damage whether the source is internal or external. Gamma rays are almost always accompanied by alpha or beta particles.

3.4.2.4 Neutron Particles

Neutron particles are uncharged elementary particles that have a mass of 1 atomic mass unit, approximately the same as that of the proton. Compared to gamma rays, neutrons cause 20 times more damage to tissue. Neutron particles come from splitting, or fissioning of certain atoms inside a nuclear reactor, or can be produced spontaneously from select radionuclides (uranium-235 and plutonium-239; or the man made radionuclide californium-252, the most commonly used source for spontaneous fission). Neutrons do not directly interact with electrons, but interaction occurs after the collision between a neutron and the nucleus of an atom, causing neutron-induced gamma activity (NIGA), or induced radiation. Because neutrons scatter as they travel, they lose some of their energy. Moderate to low-energy neutron radiation can be shielded by materials with a high hydrogen content, such as water (H₂O) or plastics with neutron absorbers; high-energy neutrons can be shielded by more dense materials, such as steel or lead. Like gamma radiation, neutrons are an external, whole-body hazard because of their high penetrating ability; however, compared to gamma rays, neutrons cause 20 times more damage to tissue.

3.4.2.5 Radionuclides

Radionuclides, often referred to as radioactive isotopes or radioisotopes, are atoms with an unstable nucleus that may either occur naturally or be artificially produced (i.e., by nuclear reactors). Gamma rays and/or subatomic particles are emitted as the radionuclide undergoes radioactive decay. See section 2.4.6, table 2–11, for a list of some radionuclides along with the harmful effects of radioactive contamination.

3.4.2.6 Background Radiation

Background radiation refers to the general level of natural and manmade radiation against which a particular added radiation component has to be considered. The biggest contributor to background radiation is radon, which accounts for roughly 54 % of annual exposure. Other naturally occurring background radiation includes cosmic radiation (8 %) and rocks and soil (8 %). Manmade sources of radiation exposure account for only a small portion of annual exposure. Manmade sources include medical x-rays (11 %), nuclear medicine (4 %), and a variety of consumer products, including smoke detectors, camping lantern mantles, timepieces, jewelry, rock collections, and pottery.

3.4.3 Properties of Radiological/Nuclear Materials

Some important properties that radiological/nuclear materials exhibit include: the type of radiation emitted, half-life, specific activity, decay energy, and radiation energy. Table 3–9 displays these properties for some common radiological materials.

Table 3–9. Basic properties of common radiological/nuclear materials

Isotope	Half-Life (years)	Specific Activity (Ci/gram)	Decay Energy (MeV)	Radiation Energy (MeV)		
				Alpha (α)	Beta (β)	Gamma (γ)
Americium-241	432.2	3.5	5.37	5.5	0.052	0.033
Californium-252*	2.645	540	—	5.9	0.0056	0.0012
Cesium-137	30.17	88	1.176	—	0.19, 0.065	0.60
Cobalt-60	5.27	1100	2.824	—	0.067	1.17, 1.33
Iodine-131	8 d	130000	0.971	—	0.19	0.38
Iridium-192	73.83 d	9200	1.04	—	0.22	0.82
Plutonium-238	87.7	17	5.46	5.5	0.011	0.0018
Plutonium-239	24110	0.063	5.243	5.1	0.0067	<0.001
Plutonium-240	6564	0.23	5.255	5.2	0.011	0.0017
Strontium-90	29.1	140	0.2	—	0.20, 0.94	—
Tritium (H-3)	12.32	9800	18.6 keV	—	0.0057	—
Uranium-235	700 million	0.0000022	4.6	4.4	0.049	0.16
Uranium-238	4.47 billion	0.00000034	4.185	4.2	0.010	0.0014

* Manmade isotope produced in nuclear reactors. Average neutron energy = 2.15 MeV; average photon energy = 0.8 MeV.

3.4.4 Pathways of Exposure

The properties of a radiological material affect the pathway by which a person receives exposure. Exposure to radiological material can be external and/or internal (inhalation or ingestion). A person can receive an external dose of radiation by standing near a gamma or high-energy beta-emitting source. A person can receive an internal dose of radiation by ingesting or inhaling radioactive material. The external exposure stops when the person leaves the area of the source. The internal exposure continues until the radioactive material is flushed from the body by natural processes or decays.

There are also different dangers associated with the type of radiation emitted. One type of radiation of major concern is ionizing radiation because of its ability to cause damage to matter, particularly living tissue. Three types of ionization radiation include alpha particles, beta particles, and gamma rays, which are all extremely dangerous at high levels.

3.4.4.1 Direct (External) Exposure

External exposure occurs when the whole body or part of the body comes in contact with penetrating radiation from an external radioactive source. Body exposure can lead to radiation burns of the skin, which appear red, swollen, and blistered. Burns do not usually appear immediately.

The greatest concern to external exposure is gamma radiation, followed by beta particles, and lastly alpha particles. Alpha particles will not penetrate skin, but can enter the body through open wounds. Beta particles can burn skin and can damage eyes. Gamma rays can penetrate the whole body, even after traveling long distances.

3.4.4.2 Internal Exposure

Internal exposure occurs when a radioactive substance is taken into the body by ingestion or inhalation. Exposure by **inhalation** happens when radiological materials (dust, smoke, radon, etc.) are breathed into the body through the lungs. Radioactive materials that are alpha and beta emitters cause the most concern for inhalation exposure because they damage cellular material and DNA in the process of transferring their energy to the surrounding tissue. If the radioactive material decays slowly, the exposure, and consequently the damage, will continue for a long time, which can eventually lead to cancer. Inhalation of radioactive dust is a serious risk since particles may remain in the lung for a long time.

Internal exposure through **ingestion** is also a serious threat, but the residence time in the body is usually shorter because the radioactive material may be eliminated by the body fairly quickly. Radioactive materials containing alpha and beta emitters are the greatest concern for exposure by ingestion. Ingestion can expose the entire intestinal tract creating the same concern to these internal organs as inhalation exposure does for the lungs. Also, some radioactive material can be absorbed by the kidneys and the bones.

Internal exposure can also occur when radioactive materials enter the body through the skin by **absorption**, or when they enter openings in the skin left by cuts or wounds.

Any of these types of exposure can be minimized by time, distance, or shielding. Limiting the amount of time spent around radiological material minimizes the exposure that can occur. Keeping as far as possible from the radiological material will decrease the chances of contamination and exposure. If a person has to be near a radiological material, shielding (keeping something between the person and the source) is the best defense against radiation. Following these guidelines can help to keep the symptoms of radiation exposure to a minimum.

3.4.5 Physiological Signs and Symptoms

The physiological signs and symptoms associated with radiological materials are highly dependent upon the type of radiation exposure. Symptoms of radiation exposure often do not occur immediately but can occur hours or even days later. The symptoms of radiation exposure are either acute or chronic.

Acute symptoms are those arising from a high dose of radiation and may include nausea, vomiting, diarrhea, hair loss, and radiation burns. The most severe sign of high radiation exposure is Acute Radiation Syndrome or radiation poisoning. Victims will experience all the symptoms of acute radiation exposure for a longer period of time and with more severity. Oftentimes the victims seem to recover and then relapse with even worse symptoms. Radiation poisoning can last from a few hours to a few months. If a victim does not recover from the symptoms of radiation poisoning, they will usually die within a few months.

Chronic signs of radiation exposure can occur years after the fact. These are due to long-term low levels of exposure. The primary sign is cancer. Radiation's presence in a body's cells disrupts their control processes and can cause them to grow uncontrollably. The radiation

exposure can also cause DNA mutations. Table 3–10 lists a number of radioactive elements along with some physical effects of exposure.

Table 3–10. Physical effects of radiological exposure

Element	Respiratory absorption, deposition	GI absorption, deposition	Skin wound absorption	Primary toxicity
Americium-241	75 % absorbed, 10 % retained	Minimal, usually insoluble	Rapid in first few days	Skeletal deposition Marrow suppression Hepatic deposition
Cesium-137	Completely absorbed Follows potassium	Completely absorbed Follows potassium	Completely absorbed Follows potassium	Renal excretion Beta and gamma emissions
Cobalt-60	High absorption Limited retention	<5 % absorption	Unknown	Gamma emitter
Iodine-131	High absorption Limited retention	High absorption Limited retention	High absorption Limited retention	Thyroid ablation/ carcinoma
Phosphorus-32	High absorption Limited retention	High absorption Limited retention	High absorption Limited retention	Bone, rapidly replicating cells
Plutonium-238, 239	High absorption Limited retention	Minimal, usually insoluble	Limited absorption. May form nodules	Lung, bone, and liver
Plutonium-238, 239 High-fired oxides	High absorption Limited retention	Minimal, usually insoluble	Limited absorption May form nodules	Local effects from retention in lung
Polonium-210	Moderate absorption Moderate retention	Minimal	Moderate absorption	Spleen and kidney
Radium-236	Unknown	30 % absorption 95 % fecal excretion	Unknown	Skeletal deposition Marrow suppression Sarcoma
Stronium-90	Limited retention	Moderate absorption	Unknown	Bone—follows calcium
Tritium or hydrogen-3 Tritiated water - HTO	HT—minimal HTO—complete	HT—minimal HTO—complete	HTO—complete	Panmyelo-cytopenia
Uranium-238-235 fluorides UO ₃ , sulfates, carbonates	High absorption High retention	High absorption	High absorption. Skin irritant	Renal Urinary excretion
Uranium-238-235, some oxides, nitrates	Moderate absorption High retention	Moderate absorption	Unknown	Nephro-toxic Urinary excretion
Uranium-238-235, high oxides, hydrides, carbides, salvage ash	Minimal absorption Retention based on particle size	Minimal absorption, high excretion	Unknown	Nephro-toxic Urinary excretion
Uranium-228, depleted uranium metal	Retention based on particle size	Minimal absorption High excretion	Forms pseudo-cysts with urinary excretion Limited absorption	Nephro-toxic Deposits in bone, kidney, and brain

3.4.6 Physical Effects of Nuclear Explosion

Three main types of physical effects are associated with a nuclear explosion, blast and shock, thermal radiation, and nuclear radiation; and each has the potential to cause death and injury to an exposed persons.

Blast injuries may be direct or indirect. Direct blast injuries are caused by the high air pressure created by the blast, and indirect blast injuries are caused by flying missiles and body displacements. The most destructive physical forces are pressures and winds, thermal pulse, and secondary fires. Psychological effects include intense acute and chronic stress disorders. Fallout and radiation dispersal devices may cause limited acute effects but can have significant long-term consequences. Table 3–11 shows the exposure levels and symptoms of radiation exposures.

Table 3–11. Radiation doses and effects

Dose	Effect
0.05 Sv to 0.2 Sv (5 rem to 20 rem)	No symptoms.
0.2 Sv to 0.5 Sv (20 rem to 50 rem)	No noticeable symptoms. Red blood cell count decreases temporarily.
0.5 Sv to 1 Sv (50 rem to 100 rem)	Mild radiation sickness with headache and increased risk of infection due to disruption of immunity cells. Temporary male sterility is possible.
1 Sv to 2 Sv (100 rem to 200 rem)	Light radiation poisoning, 10 % fatality after 30 d (LD 10/30). Typical symptoms include mild to moderate nausea, with occasional vomiting. The immune system is depressed, with convalescence extended and increased risk of infection. Temporary male sterility is common.
2 Sv to 3 Sv (200 rem to 300 rem)	Severe radiation poisoning, 35 % fatality after 30 d (LD 35/30). Nausea is common, with risk of vomiting. There is a massive loss of leukocytes, increasing the risk of infection. Permanent female sterility is possible. Convalescence takes 1 mo to several months.
3 Sv to 4 Sv (300 rem to 400 rem)	Severe radiation poisoning, 50 % fatality after 30 d (LD 50/30). Other symptoms are similar to the 2–3 Sv dose, with uncontrollable bleeding in the mouth, under the skin, and in the kidneys.
4 Sv to 6 Sv (400 rem to 600 rem)	Acute radiation poisoning, 60 % fatality after 30 d (LD 60/30). Fatality increases from 60 % at 4.5 Sv to 90 % at 6 Sv. Female sterility is common at this point. Convalescence takes several months to 1 yr. The primary causes of death (in general 2 wk to 12 wk after irradiation) are infections and internal bleeding.
6 Sv to 10 Sv (600 rem to 1000 rem)	Acute radiation poisoning, 100 % fatality after 14 d (LD 100/14). Survival depends on intense medical care. Bone marrow is nearly or completely destroyed, requiring a bone marrow transplantation. Gastric and intestinal tissue are severely damaged. Death is from infection or internal bleeding. Recovery would take several years and probably would never be complete.
10 Sv to 50 Sv (1000 rem to 5000 rem)	Acute radiation poisoning, 100 % fatality after 7 d (LD 100/7). Spontaneous symptoms occur after 5 min to 30 min. After powerful fatigue and immediate nausea, there is a period of several days of comparable well-being, after which cell death occurs in the gastric and intestinal tissue, causing massive diarrhea, intestinal bleeding, and loss of water. Death is preceded by delirium and coma. Death is inevitable; the only treatment that can be offered is pain therapy.
50 Sv to 80 Sv (5000 rem to 8000 rem)	Immediate disorientation and coma in seconds or minutes. Death occurs after a few hours by total collapse of nervous system.
>80 Sv (>8000 rem)	Immediate death.

4. PROTECTIVE GARMENTS, FOOTWEAR, AND GLOVES

A protective ensemble is defined as a combination of clothing and equipment items designed and integrated to provide an appropriate level of protection while still allowing the wearer to be able to carry out activities involving hazardous materials. Protective ensembles can be totally encapsulated or nonencapsulating. Encapsulated ensembles provide a specific level of vapor and liquid tight protection to the upper body, head, hands, legs, and feet and completely cover the wearer and the respirator. Nonencapsulating ensembles provide a specified degree of protection to the upper body, head, hands, legs, and feet, but do not cover the respiratory protective equipment.

Components forming an effective protective ensemble may incorporate a wide variety of protective equipment and clothing items, including protective garments, boots, gloves, respiratory equipment, and microclimate cooling equipment. This section focuses on those components that provide percutaneous (i.e., skin) protection to the wearer. Percutaneous protection can consist of a protective garment, protective footwear, and protective gloves. Standards and requirements associated with these components are discussed in section 4.1. Protective garments are discussed in section 4.2. Protective footwear is discussed in section 4.3, and protective gloves are discussed in section 4.4. It is important to note that respiratory protection is discussed in section 5, and microclimate cooling is discussed in section 6.

4.1 Standards and Requirements

NFPA 1994 (2001 Edition),¹² 1992 (2005 Edition), and 1991 (2001 Edition) standards address requirements for chemical and biological protective garments, footwear, and gloves. However, the standards mandate that these components must be certified as part of a complete ensemble. NFPA 1994 does not provide individual certification for these components, but NFPA 1991 and 1992 do permit individual protective footwear and glove certification. The goal of the individual certification is not to allow for ensemble components to be mixed and matched, but only to assist first responders in the selection of proper replacements should those original elements need replacement. It should be noted that protective ensemble components certified to NFPA 1992 are not tested against CAs and are therefore not to be used in a CBRN hazard environment.

The labeling on NFPA 1994, 1992, and 1991 certified ensembles does specify the elements of the certified ensemble, and the complete ensemble must only be used with those components that are identified by make and model in the certification. The manufacturer holding the certification to NFPA 1994 certified ensembles must identify the make and model of the CBRN respirator with which it was certified. It is important to understand that an ensemble certification is voided if protective components that are not included in a specific ensemble certification are used with that ensemble. This is true even if the components have been separately and independently certified as compliant with NFPA 1991 or 1992 as individual elements.

¹² It is important to note that the next edition of NFPA 1994 will include several changes. NFPA 1994 Class 1 ensembles will be transferred to NFPA 1991, where the requirements already exist. Modifications to the requirements for Class 2 and 3 ensembles will also be made and a new Class 4 will be added.

As of May 2006, all NFPA 1994 certified Class 1 ensembles were certified with the Onguard Hazmax Boot (87012) and the Guardian CP-25 Butyl Rubber Glove. The NFPA 1994 Class 2 and Class 3 ensembles were certified with a variety of boots, inner gloves, middle gloves, and outer gloves. Additional protective footwear and glove items have been certified as components of either an NFPA 1991 or 1992 certified ensemble. Because these NFPA standards are constantly evolving and do not preclude protective footwear and glove items from being certified to current or future CBRN-related NFPA Standards, protective garments, boots, and gloves that offer similar performance and protection as those already certified are also included in this guide.

The remainder of this section provides the reader with an overview of the OSHA EPA protection levels, the current NFPA standards that relate to CBRN PPE, and the two certifying organizations.

4.1.1 OSHA EPA Levels of Protection

Selection of the appropriate PPE is a complex process which takes into consideration a variety of factors including identification of the hazards, or suspected hazards; their routes of potential hazard to user (inhalation, skin absorption, ingestion, and eye or skin contact); and the performance of the PPE materials (and seams) in providing a barrier to these hazards. The amount of protection provided by PPE is material-hazard specific. The OSHA EPA levels of protection¹³ were developed to aid in the selection of appropriate PPE, to include required items as well as optional items, to be worn for a specific protection level to offer the greatest protection against hazardous materials at a job site. These levels are described in the remainder of this section.

- **EPA Level A** protection offers the maximum level of overall protection (respiratory, skin, eye, and mucous membrane). Level A ensembles use fully encapsulating chemical protective garments that meet NFPA 1994 Class 1 and/or NFPA 1991, 2005 Edition certification when worn with SCBA.
- **EPA Level B** is selected when the highest level of respiratory protection is needed (i.e., an SCBA), but a lesser level of skin and eye protection is permitted. EPA Level B garment configurations include chemical-resistant overalls and a long-sleeved jacket, coveralls, a hooded two-piece chemical splash suit, or disposable chemical resistant coveralls. Depending on the configuration in which the Level B garment is used, it may meet NFPA 1994 Class 2 and/or NFPA 1992, 2005 Edition) requirements.
- **EPA Level C** protection is selected when the type of airborne substance is known, concentration has been measured, criteria for using APRs have been met, and skin and eye exposure is unlikely. Use of this level of protection requires periodic monitoring of the air. EPA Level C garment configurations include a one-piece coverall, a hooded two-piece chemical splash suit, a chemical resistant hood and apron, or disposable chemical resistant coveralls. Depending on the configuration in

¹³ http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10653

which the Level C garment is used, it may meet NFPA 1994 Class 3 performance standards.

It is important to keep in mind that during hazardous materials emergency response, only protective ensembles offering specific levels of vapor and/or liquid hazard threat protection should be used. Unfortunately, the EPA defined levels of protection, which have historically been used during emergency response operations, do not define the performance of the chemical protective ensemble with respect to a specific threat hazard environment.

4.1.2 NFPA Standards

To address the effectiveness of PPE using the OSHA EPA levels of protection, NFPA developed comprehensive performance standards on chemical protective clothing based on material and system level performance, primarily in response to the NTSB recommendation for more appropriate PPE for emergency response. Subsequently the NFPA 1991 (vapor protective), NFPA 1992 (liquid-splash protective), and NFPA 1994 standards were adopted. The use of the NFPA standards is intended to provide the minimum level of protection for emergency responders and accounts for the broad range of hazards that emergency responders may encounter.¹⁴ Each of these three standards is described in more detail in sections 4.1.2.1, 4.1.2.2, and 4.1.2.3.

4.1.2.1 NFPA 1994 Standard (2001 Edition)

NFPA 1994 sets performance requirements for protective clothing used at chemical and biological terrorism incidents and defines three classes of ensembles based on the perceived threat at the emergency scene. The differences are based on the ability of the ensemble design to resist the inward leakage of chemical and biological contaminants, the resistance of the materials used in the construction of the ensembles to chemical agents and industrial chemicals, and the strength and durability of these materials. All NFPA 1994 ensembles are intended to be disposable after a single wearing. Ensembles must consist of garments, gloves, and footwear.¹⁵

As previously discussed, the NFPA 1994 (2001 Edition) standard has been revised with an effective date of August 2006. The new title is NFPA 1994 Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents, 2007 Edition. Ensembles certified to the NFPA 1994 (2001 Edition) cannot be procured as a certified ensemble six (6) months after the effective date of the NFPA 1994 (2007 Edition) standard. However, it should be noted that for ensembles already certified to NFPA 1994 (2001 Edition) the certification will remain in effect for the shelf-life of the ensemble.

For an item to be certified by NFPA, it must pass stringent testing. Depending on the NFPA Class, all components must be certified together as an ensemble and can only be worn as a certified ensemble; the components can be certified separately but must be worn with certified components to complete an ensemble; or the components can be certified separately and worn

¹⁴ <http://www.trelleborg.com/protective/images/stull1.pdf>

¹⁵ <http://www.seinet.org/NFPA%201994.pdf>

separately. The three NFPA 1994 classes and their relationship to the EPA protection levels are explained below.

NFPA 1994 Class 1 (comparable to EPA Level A) garments are gas-tight and offer the highest level of respiratory, skin, and eye protection from solid, liquid, and gaseous chemicals. They are available as a full-body, totally encapsulated suit with gloves and footwear and provide the highest level of protection against CB agents. Respiratory protection is provided by a SCBA.

The Kappler Zytron™ 500 Z5HTN NFPA 1994 Class 1 Certified Ensemble is an example of a NFPA Class 1 certified ensemble. It is a total encapsulating Level A (gas-tight) suit with front entry, expanded back, two covered exhaust valves, and sock boots with flared splash guards for ease of donning/doffing. It is certified by SEI as an ensemble with the following required elements:

- Glove system (attached to suits): Guardian Buyl Outer Glove (CP 25 size XL) and Ansell Barrier® inner glove (#2–100, size 11).
- Boots: Ongaard Hazmax Boot p/n 87012 (available from Kappler but not sold with suits).
- Breathing systems (one of the following): Air-Pak® Fifty™ 2.2 SCBA, AirBoss Evolution Plus CBRN SCBA 2216psig, AirBoss PSS100 CBRN SCBA 4500 psig, Firehawk SCBA 2216 psig, Firehawk SCBA 4500 psig, Interspiro Spiromatic S4 (SCBA with PASS and Buddy Breathing, Pivoting Waist), SCBA Panther, or Viking ST SCBA.

Figure 4–1 shows the Zytron™ 500 Z5HTN NFPA 1994 Class 1 Certified Ensemble manufactured by Kappler, Inc.



Figure 4–1. Zytron™ 500 Z5HTN NFPA 1994 Class 1 Certified Ensemble, Kappler, Inc.

NFPA 1994 Class 2 garments offer liquid splash protection. They are available as non-gas-tight encapsulating suits, coveralls, or two-piece overgarments. The material is impermeable and offers splash protection but not continuous liquid contact or vapor protection. Respiratory protection is a SCBA. Note: These suits cannot be substituted for EPA Level A suits because the

seams and zippers are not gas-tight. It is important to note that Class 2 defines a specific level of gas and vapor protection in conjunction with a high level of liquid splash protection. Although this combination is very important to WMD response operations, it is currently not addressed in the EPA protection levels.

An example of a NFPA Class 2 certified ensemble is the DTAPS[®] NFPA 1994, Class 2 Certified System from GEOMET Technologies, LLC. The Level B garment has integral booties and mechanically attached gloves, which are user replaceable. A separate hood seals tightly to the face mask. It is certified by SEI with the following required elements:

- Glove system: JOMAC Kevlar[®] Plus outer glove; North Safety Products neoprene/butyl glove middle glove; North Silver Shield[®]/4H[®] 2.7 mil inner glove.
- Boots: Onguard HazMax[®] Kneeboot. Boot must be worn over the integrated bootie (sold separately).
- Breathing systems: SCBA is required and must be certified as compliant to NFPA 1981 (sold separately).

Figure 4–2 shows the DTAPS[®] NFPA 1994, Class 2 Certified System from GEOMET Technologies, LLC.



Figure 4–2. DTAPS[®] NFPA 1994, Class 2 Certified System, GEOMET Technologies, LLC

NFPA 1994 Class 3 (comparable to EPA Level B and C) garments are not gas-tight and not required to show any resistance to leakage of vapor or gas from the outside environment. They are available as full-body, non-gas-tight encapsulating suits, coveralls, or two-piece overgarments with gloves and footwear and provide a minimum level of protection against CB agents. The respiratory protection may be provided by a SCBA or an APR with appropriate filter canister or cartridge.

The Tychem[®] CPF 3, Coverall with Long Overhood, Certified to NFPA 1994 Class 3, manufactured by DuPont, is an example of a NFPA Class 3 certified ensemble. The Level B coverall has a chest-length overhood and an attached 2-layer glove system. It is certified by SEI with the following required elements:

- Glove system: Ansell Neoprene #29–845 outer glove; Ansell Barrier® #2–100 inner glove.
- Boots: Oguard Hazmax Boot p/n 87012. Boot must be worn over the integrated bootie (sold separately).
- Breathing systems (respirators sold separately): MSA Millennium Respirator; 3M FR-M40 Respirator.

Figure 4–3 shows the Tychem® CPF 3, Coverall with Long Overhood from DuPont Personal Protection.



Figure 4–3. Tychem® CPF 3, Coverall with Long Overhood, DuPont Personal Protection

All NFPA 1994 certified ensembles are intended for a single exposure to a known threat after which they are to be properly decontaminated and disposed of. Ensembles must consist of garments, gloves, footwear, and respiratory equipment. Differences between the three classes are presented in table 4–1.

Table 4–1. Comparison of NFPA 1994 Class 1, Class 2, and Class 3

NFPA 1994 Standard			
Characteristics	Class 1*	Class 2	Class 3
Ensemble Configuration	Full-body, totally encapsulated suit with gloves and footwear	Full-body, encapsulating or nonencapsulating suit with gloves and footwear	Full-body, encapsulating or nonencapsulating suit with gloves and boots
CB Level of Protection	Highest	Intermediate	Minimum
Respiratory Protection	CBRN Self-contained breathing apparatus (SCBA)	CBRN SCBA	CBRN SCBA or an APR with appropriate filter canister or cartridge
Environment	Chemical or biological threat is unknown, the concentration is unknown, and the toxicity is not verified	Concentration of the hazard is immediately dangerous to life and health (IDLH) levels	Concentration of the hazard is at or below the short-term exposure limit (STEL)
Contamination Form	Gas, vapor, aerosols, liquids, or particulates	Limited exposure to gases vapors, liquid droplets, and splash	Liquid droplets and liquid splash
Skin Contact	Not permitted	Not probable	Not likely or not expected
Persistence	High	Moderate	Low
Proximity to Release	Close to the point of release both in time and distance	Separated from the point of release by either time or distance	Separated from the point of release by both time and distance

*Requirements for NFPA 1994 Class 1 ensembles have been incorporated into NFPA 1991 (2005 Edition) standards.

4.1.2.2 NFPA 1991 (2005 Edition)

Ensembles certified to the NFPA 1991 (2005 Edition) standard meet the base vapor-protection requirements and/or the optional liquefied petroleum gas protection, flash fire escape protection, and CB agent protection (also addressed in NFPA 1994). The ensembles are totally encapsulated with attached gloves and an encapsulated breathing apparatus. The NFPA 1991 (2005 Edition) standard offers at least the same level of protection as NFPA 1994 Class 1 ensembles.

An example of an ensemble certified to NFPA 1991 (2005 Edition) is the Trellechem[®] HPS Type T/TE from Trelleborg Viking, Inc. The Level A ensemble has integrated socks/booties in the garment material, and a pair of silicone-coated oversocks is also supplied with the suit. A pair of separate inner gloves is supplied with the suit, as well as semi-fixed attached Viton/Butyl rubber gloves. It is certified by SEI with the following required elements:

- Glove system: Perfect Fit Glove Company Kevlar[®] over glove; Guardian Manufacturing Chloroprene rubber glove, 35A outer glove; North Safety Products Silver Shield[®] 4H[®] inner glove.

- Boots: Onguard Hazmax boot #87012 (sold separately from an authorized Onguard dealer).
- Breathing systems: SCBA must be CBRN certified by NIOSH and certified as compliant to NFPA 1981 (sold separately).

Figure 4–4 shows the Trelchem[®] HPS Type T/TE from Trelleborg Viking, Inc.



Figure 4–4. Trelchem[®] HPS Type T/TE from Trelleborg Viking, Inc.

4.1.2.3 NFPA 1992, 2005 Edition

Ensembles certified to the NFPA 1992 (2005 Edition) standard are liquid splash-protective ensembles and clothing for hazardous materials emergencies. They are available as full-body non-gas-tight encapsulating suits, coveralls, or two-piece overgarments and provide a minimum level of protection against CB agents. Gloves and footwear may be certified separately from the garment. These ensembles provide liquid-splash protection where the exposure is only short-term contact with liquid chemicals.

An example of an ensemble certified to NFPA 1992 (2005 Edition), as well as NFPA 1994 Class 2, is the Tactix MT-94[™] from Lion Apparel. The ensemble is a non-encapsulating Level B coverall with hood and attached bootie. It is certified by SEI with the following required elements:

- Glove system: Perfect Fit Glove Company Kevlar[®] over glove; G9492–OGN JB1GU (Palm: sheep grain leather, Back: NOMEX[®] knit) outer glove; G9492–C2 GORE[™] CHEMPAK[®] Ultra Barrier inner glove.
- Boots: Lion Warhorse[™] I and Warhorse[™] II Rubber Boot.
- Breathing systems: MSA Millennium Full Face Piece APR with canister; Scott 2.2, 3.0 and 4.5 Air-Pak with AV3000[™] CBRN Facepiece.

Figure 4–5 shows the Tactix MT-94[™] from Lion Apparel.



Figure 4–5. Tactix MT-94™, Lion Apparel

4.1.3 Certifying Organizations

Ensembles, boots, and gloves are certified to an NFPA standard by either the Safety Equipment Institute (SEI) or the Underwriters Laboratories Inc. (UL). SEI is a private, nonprofit organization established to administer nongovernmental, third-party certification programs to test and certify a broad range of safety and protective products. SEI’s certification programs are accredited by the American National Standards Institute (ANSI) in accordance with the standard, ISO Guide 65, General Requirements for Bodies Operating Product Certification Systems. All product testing is done in accordance with the selected voluntary, government, or other standards available for the given product. Current standards are promulgated for various products by such organizations as ANSI, the American Society for Testing and Materials (ASTM) and NFPA.¹⁶ UL is an independent, not-for-profit organization providing global conformity assessment programs and services. These standards are used by manufacturers to help design products and systems to meet the requirements for certification, by regulatory authorities who reference the standards for products and systems used in their jurisdictions, by code development organizations that adopt and reference UL Standards for Safety, and by certification organizations that apply UL requirements for product evaluations.¹⁷

4.2 Protective Garments

Garments capable of providing the wearer with protection from CBRN threats were identified and evaluated in this guide. Section 4.2.1 provides the findings of the market survey. Section 4.2.2 lists selection factors that were developed for evaluating protective garments, and section 4.2.3 details the evaluation results for the protective garments.

4.2.1 Market Survey

An extensive market survey was conducted to identify commercially available protective garments. The market survey consisted of a solicitation of manufacturers, the review of

¹⁶ <http://www.seinet.org/>

¹⁷ <http://www.ul.com/>

previously conducted market surveys, literature searches, and consultation with subject matter experts (SMEs). In order to provide detailed information on each garment item, 47 data fields, to correspond to the vendor questionnaire, were identified. These data fields were developed by SMEs and approved for distribution by the government. Definitions for the protective garment data fields are provided in appendix C.

The market survey resulted in the identification of 42 protective garment items. The ensemble data sheets, along with an index identifying each of the ensembles, are included in appendix D. Table 4–2 details the number of protective garment items identified for each of 16 vendors that were included in the market survey.

Table 4–2. Protective garment vendors

Vendor	OSHA Protection Level			Total
	Level A	Level B	Level C	
DuPont Personal Protection	9	4		13
GEOMET	1	4		5
Indutex S.p.A		1		1
Kappler, Inc.*	1	1		2
Lakeland Industries	2			2
Lion Apparel		1		1
New Pac Safety AB		2		2
Paul Boyé		2		2
Remploy Frontline		1 [†]		1
Safety Equipment America, Inc.		1	2	3
Saint-Gobain Performance Plastics	2	1 [‡]		3
Texplorer [®] GmbH		1		1
Tex-Shield, Inc.		2 [§]		2
The Sigmon Group		1		1
Trelleborg Viking, Inc.	2			2
First Line Technology, LLC (TST/SWEDE)		1 [†]		1
Total	17	23	2	42

*Available for sale into military and medical markets.

[†]Identified as either Level B or Level C, depending on the type of respiratory protection used with the ensemble.

[‡]The ITAP Ensemble, manufactured by Saint Gobain Performance Plastics, can be a Level B or Level C garment depending on the air supply system.

[§]The Saratoga (JSLIST) and the Saratoga™ HAMMER Suit, manufactured by Tex-Shield, Inc., are military garments.

Throughout this section, garments will be referred to as ensembles. Although EPA protection levels indicate the types of garments that are used for the various protection levels, it is only when the garments are configured as part of an ensemble that the NFPA certification requirements are met. As table 4–1 indicates there are three levels of protection for protective ensembles considered in this guide: Level A, Level B, and Level C. Level A garments offer vapor or gas protection and meet the NFPA 1994 Class 1 and NFPA 1991 (2005 Edition) standard requirements. They include a pressure-demand, full-face SCBA, inner chemical-resistant gloves, and chemical-resistant safety boots. Figure 4–6 shows a Level A ensemble

from Trelleborg Viking, Inc., the Trellechem[®] VPS/VP1, which is certified to NFPA 1994 Class 1 and to NFPA 1991 (2005 Edition). Figure 4–7 shows a Level A ensemble from DuPont Personal Protection, the Tychem[®] TK, Front Entry Level A Garment, which is NFPA 1994 Class 1 certified.



Figure 4–6. Trellechem[®] VPS/VP1, Trelleborg Viking, Inc.



Figure 4–7. Tychem[®] TK, Front Entry Level A Garment, DuPont Personal Protection

EPA Level B (liquid splash protection) provides the same level of respiratory protection as Level A but less skin protection and no protection against chemical vapors or gases. Some manufacturers of the Level B ensembles have also classified their ensembles as having NFPA 1994 Class 2, NFPA 1994 Class 3, NFPA 1992 certification, or as meeting military or European requirements. An example of a Level B protective ensemble that is NFPA 1994 Class 3 certified is the CLD 420 Class 3 Protective Coverall from Paul Boyé, shown in figure 4–8. An example of a Level B ensemble that is NFPA 1994 Class 2 certified is the DTAPS[®] NFPA 1994, Class 2 Certified System, manufactured by GEOMET Technologies, LLC. (fig. 4–9).



Figure 4–8. CLD 420 Class 3 Protective Coverall, Paul Boyé



Figure 4–9. DTAPS[®] NFPA 1994, Class 2 Certified System, GEOMET Technologies

EPA Level C (NFPA 1994 Class 3) provides the same level of skin protection as Level B, i.e., liquid splash-protection, but a lower level of respiratory protection and no protection against chemical vapors or gases. Figure 4–10 shows the ITAP (Improved Toxicological Agent Protective) Ensemble, from Saint-Gobain Performance Plastics. This ensemble can be used as either Level B or Level C, depending on the type of respiratory protection that is used with it. When used with an SCBA, it offers Level B protection; when used with the CASS-compact air supply system and face mask, it offers Level C protection. The ITAP ensemble is certified under NFPA 1994 Class 2 standards.

An example of a Level C protective ensemble is the SEA/HPS manufactured by Safety Equipment America, Inc., shown in figure 4–11. It uses the Level A, NFPA 1991 (2005 Edition) certified HPS coverall manufactured by Trelleborg Viking, Inc., and reconfigures it for use with a PAPR. The slightly modified suit for use with a PAPR is not yet NFPA certified.



Figure 4–10. *ITAP (Improved Toxicological Agent Protective) Ensemble, Saint-Gobain Performance Plastics*



Figure 4–11. *SEA/HPS, Safety Equipment America, Inc.*

4.2.2 Selection Factors

An initial set of selection factors for protective garments emerged from the review of the *Guide for the Selection of Personal Protective Equipment for Emergency First Responders* (NIJ Guide 102–00) as well as the *Report on the Market Survey Results and Chemical and Biological Assessment of Level A and Level B Protective Suits*. These factors were then shared with experienced scientists and engineers who have multiple years of experience in PPE, domestic preparedness, and identification of emergency first responder needs. The factors were also shared with the emergency first responder community in order to get their thoughts and comments. The selection factors were modified to eliminate some of the initial criteria, include new criteria, and expand several definitions.

These factors were developed to allow for a quick comparison of commercially available ensembles. *It is important to note that the evaluation conducted using the selection factors was based solely upon vendor-supplied data and no independent evaluation of equipment was*

conducted in the development of this guide. The vendor-supplied data can be found in its entirety in appendix C.

The results of the evaluation of the ensembles are provided in section 4.2.3. The remainder of this section defines each of the selection factors. Details on the manner in which the selection factor was used to assess the ensembles are included within the section factor definition.

4.2.2.1 NFPA Certification

This selection factor indicates the NFPA certification associated with the ensembles. The three possible certifications include the following standards:

- NFPA 1991 Standard (2005 Edition).
- NFPA 1992 Standard (2005 Edition).
- NFPA 1994 Standard (2001 Edition).

The SEI numbering system takes one of the following three forms:

- CBT-XXX-XX.
- VPS-XXX-XX.
- LPS-XXX-XX.

The acronyms, CBT, VPS, and LPS represent the NFPA classification, where CBT stands for chem/bio protection; VPS stands for vapor protection; and LPS stands for liquid/splash protection. The middle three numbers represent the manufacturer. The last two numbers represent the approval number that SEI has assigned to a specific ensemble. NFPA 1994 certification numbers are preceded by CBT, NFPA 1991 certification numbers are preceded by VPS, and NFPA 1992 certification numbers are preceded by LPS.

The UL numbering system takes the following form: MHXXXXX.

The certification number is included in the evaluation table in section 4.2.3.

4.2.2.2 Market Price

Market price details the cost associated with the ensemble. The price indicated is the commercial price associated with the ensemble at the time that this guide was published. This price is not a special government price.

4.2.2.3 Entry Location

This selection factor designates the suit entry location, or where the user enters the suit. Possible entry locations include front (F) and/or rear (R).

4.2.2.4 Chemical Agents (CAs) Protected Against

This selection factor addresses the ability of the equipment to protect against vapor, liquid, and aerosol forms of CAs. For this process, CA threats are primarily nerve agents such as GB and VX, and vesicants such as HD. Blood agents and choking agents are considered to be TICs/TIMs. Special consideration will be given to validated materials and suit testing results.

CAs Protected Against			
Level A		Level B, C	
●	NFPA 1994 Class 1 and NFPA 1991 (2005 Ed), plus additional CA Protection	●	NFPA 1994 Class 2/3 CA, Vapor Suit plus additional CA Protection
◐	NFPA 1991 (2005 Ed), NFPA 1994 Class 1	◐	NFPA 1994 Class 2/3 CA Permeation plus Limited Vapor (Suit Test)
◑	NFPA 1992, 2005 Ed, Equal to NFPA 1994 Class 1 CA Permeation (100 g/m ²)	◑	Equal to NFPA 1994 Class 2/3 CA Permeation (droplet 10 g/m ²)
◒	NFPA 1994 Class 2, Less than NFPA 1994 Class 1 (partial protection from CA)	◒	Less than NFPA 1994 Class 2/3 (partial protection from CA) or not specified
⊗	Not specified	⊗	Not specified

4.2.2.5 Biological Agents (BAs) Protected Against

This selection factor addresses the ability of the ensemble to protect against BAs. BAs include threats such as bacteria (i.e., anthrax), rickettsia (i.e., typhus), toxins (i.e., botulinum toxin), and viruses (i.e., smallpox). Materials testing is not conducted with specific biological threat agents or their simulants. Protection from biological threats is implied as a result of passing permeation/penetration and ensemble inward leakage testing. A liquid penetration test is, however, used in screening against biological liquids for 1994. Special consideration will be given to validated materials and equipment testing results conducted using particulate and aerosol threat simulants.

BAs Protected Against	
Level A, B, C	
●	Exceeds NFPA 1994 by providing “Systems Level” Aerosol Threat Protection
◐	Exceeds NFPA 1994 Liquid Penetration & Liquid Biological Threat Protection
◑	Meets NFPA 1994 ASTM F 1671 (Liquid Penetration—Biological Threats)
◒	Less than NFPA 1994 for liquid penetration protection but some level provided
⊗	Not specified

4.2.2.6 Toxic Industrial Chemicals/Materials (TICs/TIMs) Protected Against

This selection factor describes the ability of the suit to protect against TICs/TIMs. Special consideration will be given to validated performance results for product tested against the battery of chemicals required in NFPA 1994, 1991, and 1992. The NFPA 1994 battery of industrial chemicals calls for dimethyl sulfate, ammonia, chlorine, cyanogen chloride, carbonyl chloride, and hydrogen cyanide for Class 1 and dimethyl sulfate for Class 3 ensembles. The barrier performance against the NFPA battery of 21 chemicals specified in ASTM F 1001, *Standard Guide of Chemicals to Evaluate Protective Clothing Materials*, will also be given special consideration.

TICs/TIMs Protected Against			
Level A		Level B, C	
●	Meets 1994, 1991, and 1992 plus additional chemical threats	●	Meets 1994, 1991, and 1992 plus Limited Vapor (Suit Test)
◐	Meets 1994 plus 1991/1992 ASTM F 1001 battery of 21 chemicals	◐	Meets 1994, 1991/1992 ASTM F 1001 battery of 21 chemicals
◑	Meets NFPA 1994 Class 1 liquid/gases permeation requirements	◑	Meets NFPA 1994 Class 2/3 liquid and/or gas permeation requirements
◒	Less penetration protection but some level provided	◒	Less penetration protection but some level provided
⊗	Not specified	⊗	Not specified

4.2.2.7 Radiological/Nuclear

This selection factor indicates if the protective gloves can protect against radiological particulates. Only those gloves certified to NFPA 1991 (2005 Edition) will be noted as having a radiological particulate protection capability.

Radiological/Nuclear	
●	The garment has the capability to provide protection against radiological particulates
○	The garment does not provide protection against radiological particulates
⊗	Not specified

4.2.2.8 Duration of Protection

Duration of protection indicates the amount of time the equipment provides adequate protection. Since duration varies depending on the concentration of agent, type of agent, and environmental conditions, duration will be given with respect to specific conditions. The NFPA 1994 duration of protection requirement is 60 min.

Duration of Protection	
●	≥480 min
◐	≥120 min to 479 min
◑	≥60 min to 119 min
◒	≥30 min to 59 min
⊗	Not specified

4.2.2.9 Don/Doff

Don/Doff Information indicates whether the system requires assistance for donning and/or doffing and the average time for this activity.

Don/Doff	
●	Average time for activity is ≤60 s for donning and/or doffing; assistance not required for activity
◐	Average time for activity is ≤60 s for donning and/or doffing; assistance required for activity
◑	Average time for donning and/or doffing is ≥61 s to <3 min; assistance not required for activity
◒	Average time for donning and/or doffing is ≥61 s to ≤3 min; assistance required for activity
○	Average time for donning and/or doffing is >3 min; assistance may be required for activity
⊗	Not specified

4.2.2.10 Weight

Weight is the total weight of the equipment/system and indicates how long the equipment can be worn with no ill effects for the user. This should be considered in conjunction with the dexterity/mobility selection factor. Weight is more critical for a Level A ensemble than for a Level B or Level C ensemble. It is assumed that all NFPA certified ensembles will have passed *ASTM F 1154 Standard Practice for Qualitatively Evaluating the Comfort, Fit, Function, and Integrity of Chemical-Protective Suits*.

Weight			
Level A		Level B, C	
●	≤7 lb	●	≤3 lb
◐	>8 lb to ≤12 lb	◐	>4 lb to ≤7 lb
◑	>13 lb to ≤21 lb	◑	>8 lb to ≤12 lb
◒	>22 lb to ≤29 lb	◒	>13 lb to ≤18 lb
○	≥30 lb	○	≥19 lb
⊗	Not specified	⊗	Not specified

4.2.2.11 Training Requirements

Training requirements indicate the amount of instruction time required for the responder to become proficient in the operation and maintenance of the suit. Also, fully encapsulated garments may require specific donning and doffing training. Continuous training or periodic recertification in the use of the equipment is considered with this selection factor.

Training Requirements	
●	Classroom training available; results in certification
◐	Manual and/or CD provided by manufacturer; results in certification
◑	Classroom training available; does not result in certification
◒	Manual and/or CD provided by manufacturer; does not result in certification
○	Training not provided by the manufacturer
⊗	Not specified

4.2.2.12 Package Volume

This selection factor will look at the volume associated with storing the packaged version of the suit. This is an important factor because of limited space within the emergency vehicles. This may be more of an issue for Level A suits than Level B suits.

Package Volume (pv)			
Level A		Level B, C	
●	$\leq 2 \text{ ft}^3$	●	$\leq 1 \text{ ft}^3$
◐	$\leq 3 \text{ ft}^3$	◐	$\leq 2 \text{ ft}^3$
◑	$\leq 4 \text{ ft}^3$	◑	$\leq 3 \text{ ft}^3$
◒	$> 4 \text{ ft}^3$	◒	$> 3 \text{ ft}^3$
⊗	Not specified	⊗	Not specified

4.2.2.13 Field of View (FOV)

The field of view (FOV) selection factor addresses the percentage of unobstructed view the user has while wearing the protective suit and respirator. This selection factor will consider both the size of the visor and its impact on peripheral vision. The ability to effectively see objects while looking down or up will be considered. If the suit design configuration has a hood and visor that fully covers the head and respiratory protective equipment, the selection factor will be used. This selection factor is not applicable (NA) if the suit design does not have a visor covering the respirator facepiece.

Field of View (FOV)	
●	Effective field of view ≥ 90 % of natural FOV
◐	Effective field of view ≥ 80 % of natural FOV
◑	Effective field of view ≥ 70 % of natural FOV
◒	Effective field of view < 70 % of natural FOV
○	Not applicable
⊗	Not specified

4.2.2.14 Shelf Life

This selection factor considers the estimated shelf life of the equipment without suffering any detrimental effects. It also considers the optimal storage conditions, any routine maintenance requirements, and in-service performance inspection procedures. The selection factor will also consider completeness of Technical Data Package (TDP) especially in the area of maintenance.

Shelf Life	
●	Shelf life ≥ 15 yr; has a complete TDP; no more than semi-annual maintenance; nothing more than normal storage conditions
◐	Shelf life ≥ 10 yr; has a complete TDP; no more than semi-annual maintenance; nothing more than normal storage conditions
◑	Shelf life ≥ 5 yr; has a complete TDP; no more than semi-annual maintenance; nothing more than normal storage conditions
◒	<5 yr; or requires extraordinary storage conditions, or does not include a complete TDP, or requires more than semi-annual maintenance
⊗	Not specified

4.2.2.15 Sizes Available

This selection factor refers to the variety of sizes available to the first responder community. There should be enough sizes to adequately fit most of the members of the response team, both male and female. A one-size-fits-all concept may be attractive for certain items but may not serve the responder community, which is made up of diverse personnel. The sizing categories defined in the American National Standard for Limited-Use and Disposable Coveralls—Size and Labeling Requirements, ANSI/ISEA 101–1966 defines dimensions for X-Small, Small, Medium, Large, X-Large, XX-Large, and XXX-Large.

Sizes Available	
●	More than 7 sizes
◐	6 sizes to 7 sizes
◑	4 sizes to 5 sizes
◒	3 sizes
○	One size fits all
⊗	Not specified

4.2.3 Evaluation Results

The evaluation results for the garments are presented in tabular format for the 42 protective garments identified during the development of this guide. The ensembles are grouped according to their EPA protection level, i.e., Level A, Level B, and Level C. Within these protection levels, the NFPA certification status for each garment is identified, along with the mode of entry into the garment (front or back) and the cost of the garment. The table includes the specific ensemble and the symbol that corresponds to how the ensemble was characterized based on each of the selection factor definitions. The acronym “NA” is displayed in the appropriate cell if the data were not applicable for a piece of equipment. The results of categorizing the protective garments are presented in table 4–3 through table 4–5.

Twenty-nine ensembles with NFPA certification status were identified in the development of this guide. Of these 29 ensembles, 16 are considered EPA Level A; 11 are considered EPA Level B; and two are considered Level B and/or Level C depending on the level of respiratory protection used by the ensemble. Seven of the NFPA certified Level A ensembles are certified to NFPA 1994 Class 1 (2001 Edition) standards, eight are certified to NFPA 1991 [2000 Edition (one) or 2005 Edition (seven)], and one has dual certifications, NFPA 1994 Class 1 (2001 Edition) standards and NFPA 1991 (2005 Edition). Table 4–3 shows the results of the EPA Level A CB protective garments.

One of the NFPA certified Level B ensembles is certified to NFPA 1994 Class 2 (2001 Edition) standards, seven are certified to NFPA 1994 Class 3 (2001 Edition) standards, and three are certified to NFPA 1992 (2005 Edition). Two have dual NFPA certifications, NFPA 1994 Class 2 (2001 Edition) and NFPA 1992 (2005 Edition). One of the dual certified ensembles was also noted to have Level C protective capabilities, depending on the level of respiratory protection used with the ensemble. One Level B/Level C ensemble has been submitted for dual certification, NFPA 1994 Class 3 and NFPA 1001 (2005 Edition). Table 4–4 shows the results of the EPA Level B CB protective garments.

None of the Level C ensembles have NFPA certification. However, as mentioned, two of the Level B ensembles could be either Level B or Level C, depending on the respiratory protection used with the ensemble. In addition, two of the Level C ensembles used Level A garments and reconfigured them to be used with a PAPR. Since there are no NIOSH CBRN standards for PAPR, these ensembles cannot be certified. Table 4–5 shows the results of the EPA Level C protective garments. The remaining ensembles in table 4–5 either had no NFPA certification status or had met European or military standards.

In addition to the 42 ensembles that were evaluated, appendix E includes a listing of ensembles that were identified but, according to the manufacturer, were not being considered for certification. This listing includes points of contact, model numbers, and EPA protection levels.

Table 4-3. Protective garment evaluation results (EPA Level A)

ID Number	Brand and Model	NFPA Certification	Cost	Entry	Capabilities and Features											
					CAs	BA	TICs/TIMs	Rad/Nuclear	Duration	Don/Dooff	Weight	Training	Package Volume	Field of View	Shelf Life	Sizes
EPA LEVEL A AND CERTIFICATION STATUS																
1	DuPont Tychem® Responder RS612T	NFPA 1994 Class 1 CBT-DUP-02, 08	\$776	F	●	●	●	○	○	●	○	●	●	⊗	○	●
2	DuPont Tychem® Responder RS613T	NFPA 1994 Class 1 CBT-DUP-05, 09	\$776	R	●	●	●	○	○	●	○	●	●	⊗	○	●
3	DuPont Tychem® TK TK612T	NFPA 1994 Class 1 CBT-DUP-03	\$813	F	●	●	●	○	○	●	○	●	●	○	○	●
4	DuPont Tychem® TK TK613T	NFPA 1994 Class 1 CBT-DUP-04	\$813	R	●	●	●	○	○	●	○	●	●	○	○	●
5	Kappler Zytron™ 500 Ensemble Z5HTN CH	NFPA 1994 Class 1 CBT-KPR-01	\$995	F	○	●	○	○	○	●	●	○	●	⊗	○	●
6	Lakeland Tychem TK Ensemble TK644, TK644W, TK654, TK654W	NFPA 1994 Class 1 MH28356	\$1.35 K	R	○	○	○	○	●	⊗	○	○	●	○	○	●
7	Saint-Gobain STEPO 8415-01-454-1627	NFPA 1994 Class 1 CBT-SGP-01		F	○	○	○	○	●	○	○	○	●	●	○	○
8	Trelleborg Trellechem® VPS/VP1	NFPA 1994 Class 1 NFPA 1991 (2005 Ed) VPS-TRE-10	\$2.3K	F,R	●	●	●	●	●	●	○	○	○	○	○	●
18	DuPont Tychem® Reflector® Garment RF600T	NFPA 1991 (2005 Ed) CBT-DUP-06	\$1.63 K	F	●	○	●	●	○	○	○	○	○	⊗	○	●
19	DuPont Tychem® Responder® Garment RS600T	NFPA 1991 (2005 Ed) VPS-KAP-03, 12	\$1.74 K	F	●	○	●	●	○	○	○	○	○	⊗	○	●
20	DuPont Tychem® Responder® Garment RS601T	NFPA 1991 (2005 Ed) VPS-KAP-04; 13	\$1.74 K	R	●	○	●	●	○	○	○	○	○	⊗	○	●
21	DuPont Tychem® TK Garment TK600T	NFPA 1991 (2005 Ed) VPS-DUP-01	\$1.5K	F	●	○	●	●	○	○	○	○	○	○	○	●
22	DuPont Tychem® TK Garment TK601T	NFPA 1991 (2005 Ed) VPS-DUP-02	\$1.5K	R	●	○	●	●	○	○	○	○	○	○	○	●
23	Lakeland Tychem TK Ensemble TK645, TK645W, TK655, TK655W	NFPA 1991 (2001 Ed) MH28014	\$1.35 K	F,R	●	○	●	●	○	○	○	○	○	○	○	●
24	Trellechem® Ensemble HPS Type T/TE	NFPA 1991 (2005 Ed) VPS-TRE-01	\$4.6K	F,R	●	●	●	●	●	○	○	○	○	○	○	●
42	Saint-Gobain ONESuit™ TEC 1S-A-LG	NFPA 1991 (2005 Ed) VPS SGP 07	\$2.1K	F	●	●	●	●	●	○	○	○	○	⊗	○	○

Table 4-4. Protective garment evaluation results (EPA Level B)

ID Number	Brand and Model	NFPA Certification	Cost	Entry	Capabilities and Features											
					CAs	BAs	TICs/TIMs	Rad/Nuclear	Duration	Don/Doff	Weight	Training	Package Volume	Field of View	Shelf Life	Sizes
EPA LEVEL B AND CERTIFICATION STATUS																
9	GEOMET DTAPS® 10-310	NFPA 1994 Class 2 CBT-GEO-01	\$342	F	●	●	●	○	○	●	○	●	●	●	○	●
10	Lion Apparel Tactix MT-94™ CMTM10, CMTM20	NFPA 1994 Class 2 CBT-LNS-01 NFPA 1992 (2005 Ed)	\$1.9K	R	●	●	●	○	○	●	●	●	●	○	○	●
11*	Saint-Gobain ITAP Ensemble 8415-01-463-5829	NFPA 1994 Class 2 CBT-SGP-02 NFPA 1992 (2005 Ed) LPS-SGP-01		F	○	○	○	○	○	○	○	○	○	○	○	○
12	DuPont Tychem® Coverall w/ Short Overhood C3610T	NFPA 1994 Class 3 CBT-DUP-01	\$141	F	●	○	○	○	○	●	○	○	○	○	○	●
13	DuPont Tychem® Coverall w/ Long Overhood C3611T	NFPA 1994 Class 3 CBT-DUP-01	\$141	F	●	○	○	○	○	●	○	○	○	○	○	●
14	Indutex JetGuard® PLUS Ensemble 53320183	NFPA 1994 Class 3 CBT-IND-01	\$125	F	○	●	○	○	○	○	○	○	○	○	○	●
15	Kappler Zytron™ 300 Hooded Coverall Z3HCF TN	NFPA 1994 Class 3 CBT-KPR-02	\$220	F	○	●	○	○	○	○	○	○	○	○	○	●
16	Paul Boyé CLD 420, Protective Coverall CLD 420	NFPA 1994 Class 3 MH29805	\$170	F	○	○	○	○	○	○	○	○	○	○	○	○
17	The Sigmon System Ensemble SGDC-NFPA-T11	NFPA 1994 Class 3 MH29774	\$359	F	○	○	○	○	○	○	○	○	○	○	○	○
25	DuPont Tychem® ThermoPro TP188T	NFPA 1992 (2005 Ed) LPS-DUP-01	\$432	F	●	○	○	○	○	●	○	○	○	○	○	○
26	DuPont Tychem® ThermoPro TP189T	NFPA 1992 (2005 Ed) LPS-DUP-01-Variant 01	\$432	R	●	○	○	○	○	●	○	○	○	○	○	○
29	GEOMET DTAPS® Totally-Encapsulating 10-260	NFPA 1992 (2005 Ed) CBT-GEO-03	\$573	F	○	○	○	○	○	○	○	○	○	○	○	○
31	First Line Technology (SWEDE) Butyl Coverall TST320-46960	Submitted 1994 NFPA Class 3 Submitted NFPA 1991 (2005 Ed)	\$919	F	○	○	○	○	○	○	○	○	○	○	○	○
41	Remploy Frontliner CBRN Ensemble 001	NFPA 1994 Class 3	\$1.5K	F,R	●	○	○	○	○	○	○	○	○	○	○	○

* Identified as EPA Level B or EPA Level C, depending on the type of respiratory protection used with the ensemble.

Table 4-5. Protective garment evaluation results (without certification status)

ID Number	Brand and Model	NFPA Certification	Cost	Entry	Capabilities and Features											
					CAs	BA s	TICs/TIMs	Rad/Nuclear	Duration	Don/Doff	Weight	Training	Package Volume	Field of View	Shelf Life	Sizes
EPA LEVEL A																
32	GEOMET DTAPS® Suit 10-100		\$630	F	●	●	●	○	●	○	●	●	●	●	●	●
EPA LEVEL B																
30	New Pac First Responder Kit C/91, C/91R, C/91FR		\$325	F	●	●	●	○	●	○	●	●	●	●	●	⊗
33	GEOMET DTAPS® System 10-400		\$165	F	●	●	●	○	●	○	●	○	●	○	●	●
34	GEOMET DTAPS® System 10-500		\$84	F	●	●	●	○	●	⊗	●	○	●	○	●	●
35	Paul Boyé Protective Coverall CLD100.29001		\$100	F	●	●	●	○	●	●	●	○	●	○	●	●
36	SEA Tyvek® F Suit Level B 50104		\$201	F	⊗	⊗	⊗	○	⊗	○	●	●	●	○	○	○
37	New Pac Safety AB S/89 and Military Survival Kit S/89		\$76	F	●	●	⊗	○	⊗	●	●	●	●	●	●	⊗
38	Texplorer®/GmbH Spiratex® Hybrid Military		\$610	F	●	⊗	⊗	○	⊗	○	●	●	○	●	○	●
EPA LEVEL C																
27*	SE-Shield Personal Protective Ensemble/VPS 50090		\$4.4 K	F,R	●	●	●	○	●	●	●	○	●	○	●	●
28*	SE-Shield Personal Protective Ensemble/HPS 50096		\$5.54 K	F,R	●	●	●	○	●	●	○	●	○	●	○	●
39†	Tex-Shield, Inc. Saratoga™ JSLIST 415-01-444-XXXX		\$350	F	⊗	⊗	⊗	○	●	○	○	○	●	○	○	●
40†	Tex-Shield, Inc. Saratoga™ HAMMER Suit TSCN0756-XX-		\$350	F	⊗	⊗	⊗	○	●	⊗	⊗	⊗	⊗	○	⊗	●

* NFPA Class 1 garment, modified for use with PAPR

† Military

4.3 Protective Footwear

Protective footwear capable of providing the wearer with protection from CBRN threats were identified and evaluated in this guide. Section 4.3.1 provides the findings of the market survey. Section 4.3.2 lists selection factors that were developed for evaluating protective footwear, and section 4.3.3 details the evaluation results for the protective footwear.

4.3.1 Market Survey

An extensive market survey was conducted to identify commercially available protective footwear. The market survey consisted of a solicitation of manufacturers, the review of previously conducted market surveys, literature searches, and consultation with SMEs. In order to provide detailed information on each boot item, 35 data fields, to correspond to the vendor questionnaire, were identified. These data fields were developed by SMEs and approved for distribution by the government. Definitions for the protective footwear data fields are provided in appendix F.

The market survey resulted in the identification of 17 protective footwear items. The protective footwear data sheets, along with an index identifying each of the protective footwear items, are included in appendix G.

Table 4–6 details the number of CB protective footwear items identified for each of nine vendors that were included in the market survey.

Table 4–6. Protective footwear vendors

Vendor	Primary Protective Footwear	Outer Protective Footwear	Inner Protective Footwear	Total
AirBoss Engineering Products, Inc.	3*	1		4
Lanx Fabric Systems			1	1
Lion Apparel	1			1
North Safety Products	1	2		3
Onguard Industries LLC	2	2		4
Paul Boyé		1		1
Pro Warrington, Ltd.	1			1
Tingley Rubber Corporation	1			1
Weinbrenner Shoe Company	1			1
Total	10	6	1	17

*The AirBoss ALMSB is obsolete and has been replaced.

As table 4–6 indicates, there are three types of protective footwear items considered in this guide: primary protective footwear, outer protective footwear, and inner protective footwear liner. Primary protective footwear can be defined as basic footwear that offers both structural (e.g., steel toe and steel shank) and barrier protection against CA, BA, and TICs/TIMs. When discussing PPE, the primary protective footwear is typically referred to as the protective boot.

Figure 4–12 shows one example of a primary protective boot, the Hazmax Kneeboot (16 in), manufactured by Onguard Industries. The Hazmax Kneeboot (16 in) is NFPA 1991 (2005 Edition) certified as a stand-alone boot and is also used with all NFPA 1994 Class 1 and NFPA 1991 (2005 Edition) certified ensembles. Figure 4–13 shows the HazProof Overboot from Tingley Rubber Corporation, which is NFPA 1991 (2005 Edition) certified as a stand-alone boot. Figure 4–14 shows the Thorogood Neoprene Rubber Structural and Haz-Mat Fire Boot with Lug Sole from Weinbrenner Shoe Company, which is NFPA 1992 (2005 Edition) certified as a stand alone boot.



Figure 4–12. Hazmax Kneeboot (16 in), Onguard Industries LLC



Figure 4–13. HazProof, Tingley Rubber Corporation



Figure 4–14. Thorogood Neoprene Rubber Structural and Haz-Mat Fire Boot, Weinbrenner Shoe Company

Outer protective footwear is defined as secondary footwear that is large enough to be worn over existing footwear (e.g., a combat boot) to offer additional chemical barrier protection. Outer protective footwear looks similar to the primary protective footwear but is more flexible and can be easily stored and carried. It does not offer any additional structural protection. Examples of outer protective footwear include the Servus Black Vinyl Overshoe from North Safety Products (fig. 4–15) and the AirBoss Lightweight Overboot (ALO) from AirBoss Engineering Products, Inc. (fig. 4–16).



Figure 4–15. Servus Black Vinyl Overshoe, North Safety Products



Figure 4–16. Airboss Lightweight Overboot (ALO), Airboss Defense

An inner protective footwear liner offers an additional layer of comfort and barrier protection and is worn under the primary footwear, like a sock. An example of inner protective footwear is the Lanx Chemical Protective Boot Liner, from Lanx Fabric Systems (fig. 4–17). It was the only inner protective footwear liner identified during the market survey.



Figure 4–17. Chemical Protective Boot Liner, Lanx Fabric Systems

A product being developed by the International Association of Fire Fighters (IAFF) as part of their “Project HEROES” (Homeland Emergency Response Operational and Equipment Systems) initiative has received a federal government contract by TSWG with funding from DHS. This project involves rapid development of a next generation structural fire fighting PPE with CBRN protective qualities without sacrificing thermal protection, comfort and functionality.¹⁸ Figure 4–18 shows the integrated boots and pants that will be part of this system. Boots will be modified to accept the bootie liner extension and hold the bootie in place.



Figure 4–18. Integrated boots and pants

4.3.2 Selection Factors

An initial set of selection factors for protective footwear emerged from the review of the *Guide for the Selection of Personal Protective Equipment for Emergency First Responders* (NIJ Guide 102–00) as well as the *Report on the Market Survey and Assessment of Alternative and Supplemental Personal Protective Equipment*. These factors were then shared with experienced

¹⁸ <http://www.mnlsupply.com/projectheroes.htm>

scientists and engineers who have multiple years of experience in PPE, domestic preparedness, and identification of emergency first responder needs. The factors were also shared with the emergency first responder community in order to get their thoughts and comments. The selection factors were modified to eliminate some of the initial criteria, include new criteria, and expand several definitions.

These factors were developed to allow for a quick comparison of commercially available protective footwear items. *It is important to note that the evaluation conducted using the selection factors was based solely upon vendor-supplied data and no independent evaluation of equipment was conducted in the development of this guide.* The vendor-supplied data can be found in its entirety in appendix G.

The results of the evaluation of the protective footwear items are provided in section 4.3.3. The remainder of this section defines each of the selection factors. Details on the manner in which the selection factor was used to assess the footwear items are included within the selection factor definition.

4.3.2.1 NFPA Certification

This selection factor indicates the NFPA certification associated with the protective footwear. The three possible certifications include the following standards:

- NFPA 1991 Standard (2005 Edition).
- NFPA 1992 Standard (2005 Edition).
- NFPA 1994 Standard (2001 Edition).

The SEI numbering system takes one of the following three forms:

- CBT-XXX-XX.
- VPS-XXX-XX.
- LPS-XXX-XX.

The acronyms, CBT, VPS, and LPS represent the NFPA classification, where CBT stands for chem/bio protection; VPS stands for vapor protection; and LPS stands for liquid/splash protection. The middle three numbers represent the manufacturer. The last two numbers represent the approval number that SEI has assigned to a specific ensemble. NFPA 1994 certification numbers are preceded by CBT, NFPA 1991 certification numbers are preceded by VPS, and NFPA 1992 certification numbers are preceded by LPS.

The UL numbering system takes the following form: MHXXXXX

The certification number is included in the evaluation table in section 4.3.3.

4.3.2.2 Market Price

Market price details the cost associated with the protective footwear. The price indicated is the commercial price associated with the protective footwear at the time that this guide was published. This price is not a special government price.

4.3.2.3 Chemical Agents Protected Against

This selection factor addresses the ability of the footwear to protect against vapor, liquid, and aerosol forms of CAs. For this process, CA threats are primarily nerve agents such as GB and VX, and vesicants such as HD. Blood agents and choking agents are considered to be TICs/TIMs. Special consideration will be given to validated materials and footwear testing results.

CAs Protected Against			
Level A		Level B	
●	NFPA 1994 Class 1 and NFPA 1991	●	NFPA 1994 Class 3 CA permeation persistence (10 g/m ²), open top
◐	NFPA 1994 Class 1 CA permeation resistance (100 g/m ²)	○	Does not meet requirements
○	Does not meet requirements	⊗	Not specified
⊗	Not specified		

4.3.2.4 Biological Agents Protected Against

This selection factor addresses the ability of the footwear to protect against BAs. BAs include threats such as bacteria (i.e., anthrax), rickettsia (i.e., typhus), toxins (i.e., botulinum toxin), and viruses (i.e., smallpox). Materials testing is not conducted with specific biological threat agents or their simulants. Protection from biological threats is implied as a result of passing permeation/penetration and ensemble inward leakage testing. A liquid penetration test is, however, used in screening against biological liquids for 1994. Special consideration will be given to validated materials and equipment testing results conducted using particulate and aerosol threat simulants.

BAs Protected Against	
Level A, B, C	
●	Meets NFPA 1994 by providing “systems level” aerosol threat protection
◐	Meets NFPA 1994 liquid penetration and liquid biological threat protection
◑	Meets NFPA 1994 ASTM F 1671 (liquid penetration—biological threats)
◒	Less than NFPA 1994 for liquid penetration protection but some level provided
⊗	Not specified

4.3.2.5 Toxic Industrial Chemicals/Materials Protected Against

This selection factor describes the ability of the footwear to protect against TICs/TIMs. Special consideration will be given to validated performance results for product tested against the battery of chemicals required in NFPA 1994, 1991, and 1992. The NFPA 1994 battery of industrial chemicals calls for dimethyl sulfate, ammonia, chlorine, cyanogen chloride, carbonyl chloride, and hydrogen cyanide for Class 1 and dimethyl sulfate for Class 3 ensembles. The barrier performance against the NFPA battery of 21 chemicals specified in ASTM F 1001, *Standard Guide of Chemicals to Evaluate Protective Clothing Materials*, will also be given special consideration.

TICs/TIMs Protected Against			
Level A		Level B, C	
●	Meets 1994, 1991, and 1992 plus additional chemical threats	●	Meets 1994, 1991, and 1992 plus limited vapor (Suit Test)
◐	Meets 1994 plus 1991/1992 ASTM F 1001 battery of 21 chemicals	◐	Meets 1994, 1991/1992 ASTM F 1001 battery of 21 chemicals
◑	Meets NFPA 1994 Class 1 liquid/gases permeation requirements	◑	Meets NFPA 1994 Class 2/3 liquid and/or gas permeation requirements
◒	Less penetration protection but some level provided	◒	Less penetration protection but some level provided
⊗	Not specified	⊗	Not specified

4.3.2.6 Radiological/Nuclear

This selection factor indicates if the protective footwear can protect against radiological particulates. Only footwear certified to NFPA 1991 (2005 Edition) will be noted as having a radiological particulate protection capability.

Radiological/Nuclear	
●	The footwear has the capability to provide protection against radiological particulates
○	The footwear does not provide protection against radiological particulates
⊗	Not specified

4.3.2.7 Duration of Protection

This selection factor indicates the amount of time the equipment provides adequate protection. Since duration varies depending on the concentration of agent, type of agent, and environmental conditions, duration will be given with respect to specific conditions. The NFPA 1994 duration of protection requirement is 60 min.

Duration of Protection	
●	≥2 h
◐	≥60 min but <2 h
◑	≤60 min
⊗	Not specified

4.3.2.8 Durability

Durability is the resistance of the protective footwear to being cut, torn, or punctured. Boot Durability Performance Measures (Reference NFPA 1994 Paragraphs 7.1.4.2–6 & 3 and 7.3.3.4–6)

- Class 1: Upper Cut Resistance Test (ASTM F1790) 800 g load not less than 25 mm travel.
- Class 3: Upper Cut Resistance Test (ASTM F1790) 400 g load not less than 25 mm travel.
- Class 1 & 3: Puncture Resistance Test (ASTM 1342) not less than 36N
- Class 1 & 3: Boot Sole & Heel Abrasion resistance rating not less than 65 (using NBS abrader).
- Class 1: Boot Sole & Heel Puncture Resistance Test (ASTM 1342) not less than 1.21kN.
- Class 1: Boot Toe impact & compression resistance testing (ANSI Z41). Impact not less than 101.7J and compression not less than 11121N.

Durability			
Level A		Level B, C	
●	Meets 5 standards	●	Meets 3 standards
◐	Meets 4 of 5 standards	◐	Meets 2 of 3 standards
◑	Meets 3 of 5 standards	◑	Meets 1 of 3 standards
◒	Meets 2 of 5 standards	○	Has not been tested
○	Meets 1 of 5 standards	⊗	Not specified
⊗	Not specified		

4.3.2.9 Weight

This selection factor provides the total weight for one pair of a standard size large boot.

Weight			
Level A		Level B, C	
●	≤2 lb	●	≤1 lb
◐	>2 to ≤5 lb	◐	>1 lb but ≤2
◑	>5 lb to ≤7 lb	◑	>2 lb but ≤3 lb
◒	>7 to ≤10 lb	◒	>3 lb
○	>10 lb	⊗	Not specified
⊗	Not specified		

4.3.2.10 Traction/Slip Resistance

Traction/slip resistance includes both the safety aspects of the boot, i.e., slip resistance on wet surfaces, as well as the ease of cleaning the sole of the boot. A sole that has very deep grooves and offers good traction may be harder to clean. A boot with a “slip resistant” sole may be easy to clean but may not offer adequate traction.

Traction Performance Measures (Reference: NFPA 1994 Paragraphs: 7.1.4.6, & 7.3.4.7)
Class 1 & 3: Boot soles shall have a slip resistance tested (ASTM F 489) static coefficient of 0.75 or greater.

Traction/Slip Resistance	
●	Sole will have better slip resistance than the standard (static coefficient of ≥ 0.75)
◐	Sole has met the slip resistance standard
◑	Sole is expected to meet the slip resistance standard
◒	Sole has slip resistance but does not meet slip resistance standard
○	Sole has no slip resistance or not tested
⊗	Not specified

4.3.2.11 Don/Doff

Don/Doff procedures considers the ease of putting on or taking off the boots. Buckled-boots versus pull-on boots will most likely be considered under this criterion.

Don/Doff	
●	Can easily slip on and off without using hands
◐	Assistance not needed, but boot has mechanism(s) for donning/doffing
◑	Assistance not needed, but must use hands for donning/doffing
◒	Assistance is needed for donning/doffing
⊗	Not specified

4.3.2.12 Boot Height

NFPA 1994 (paragraph 6.4.2) requires that a protective boot must not be less than 8 in high when measured from the plane of the sole bottom. This selection factor focuses on boot heights, keeping in mind that some heights in excess of 8 in may not be ideal for the wearer.

Boot Height	
●	11 in, or can be modified (has cut-off bands) so the height is no more than 11 in
◐	Between 8 in and 10 in, or between 12 in and 16 in
◑	8 in
◒	Less than 8 in or greater than 16 in
⊗	Not specified

4.3.2.13 Boot Closures

This selection factor focuses on how well the boot provides ankle support, as well as a tight fit and the ease of operation of the closures.

Boot Closures	
●	Closures available (can be adjusted)
◐	Closures available (cannot be adjusted)
◑	Closures not available
⊗	Not specified

4.3.2.14 Package Shelf Life

This selection factor considers the length of time an unopened package of boots can be reasonably stored under normal storage conditions without compromising the boots' effectiveness.

Shelf Life	
●	Shelf life ≥ 15 yr; requires nothing more than normal storage conditions
◐	Shelf life ≥ 10 yr; requires nothing more than normal storage conditions
◑	Shelf life ≥ 5 yr; nothing more than normal storage conditions
◒	<5 yr; or requires extraordinary storage conditions
⊗	Not specified

4.3.2.15 Sizes Available

This selection factor refers to the variety of sizes available to the first responder community. There should be enough sizes to adequately fit most of the members of the response team, both male and female. The NFPA 1994 Standard requires boot sizes ranging from a man's size 6 to size 15. However, a man's size 5 is comparable to a woman's size 7, so the NFPA standard does not include adequate shoe sizes for women.

Sizes Available	
●	More than 7 sizes
◐	5 sizes to 7 sizes
◑	4 sizes to 5 sizes
◒	2 sizes to 3 sizes
○	One size fits all
⊗	Not specified

4.3.3 Evaluation Results

The evaluation results for the protective footwear are presented in tabular format for the 17 items identified during the development of this guide. The protective footwear items are grouped according to their basic function, i.e., primary boot (basic footwear that offers essential structural and barrier protection against CA, BA, TICs/TIMs), overboots (footwear designed to wear over primary footwear that offers additional permeation/penetration protection), and protective liners

(footwear worn under primary footwear that offers additional comfort and barrier protection). Within these categories, the NFPA certification status for each protective footwear item is identified along with the cost of each item. The table includes the specific footwear item and the symbol that corresponds to how it was characterized based on each of the selection factor definitions. The acronym “NA” is displayed in the appropriate cell if the data were not applicable for a piece of equipment. The results of categorizing the protective footwear are presented in table 4–7.

Ten protective footwear items considered primary boots were identified in the development of this guide. Of these ten items, seven are certified as stand-alone items. Three of the seven meet NFPA 1991 (2005 Edition) standards; two meet NFPA 1992 (2005 Edition) standards; and two meet NFPA 1971 (2000 Edition) standards for structural firefighting. The remaining three primary boots have not been certified as stand-alone items or have not been certified with an ensemble.

Six overboots were identified in the development of this guide. No standard currently applies for these items.

One protective liner was identified in the development of this guide. It is not used with a certified ensemble.

Table 4–7. Protective footwear evaluation results

ID Number	Brand and Model	NFPA Stand-Alone Protective Footwear Certifications	Cost	Capabilities and Features												
				CAs	BA _s	TICs/TIMs	Rad/Nuclear	Duration	Durability	Weight	Traction	Don/DoFF	Height	Closures	Shelf Life	Sizes
PRIMARY BOOTS —Basic footwear that offers essential structural and barrier protection against CA, BA, and TICs/TIMs																
1	AirBoss Toxicological Agent Protective Boot TAP 8430–00–820–6301		\$85	●	●	◐	○	●	◐	◐	●	◐	○	○	◐	◐
2	AirBoss Lightweight Multipurpose Safety Boot ALMSB	Obsolete	\$85	●	●	◐	○	●	●	◐	●	◐	◐	○	◐	◐
3*	Lion Warhorse I and Warhorse II Rubber Boot	NFPA 1971 (2001 Ed) SA8063	\$115	○	○	◐	○	●	●	⊗	●	◐	⊗	●	⊗	●
4	North Hazmat Knee Boot 75177	OSHA Level A	\$84	●	◐	◐	○	⊗	◐	◐	⊗	◐	◐	○	◐	◐
5 [†]	Onguard Hazmax Kneeboot 87012	NFPA 1991 (2005 Ed) VPS–OIL–01	\$52	●	●	◐	●	●	●	◐	●	◐	●	○	●	◐
6 [‡]	Onguard Hazmax EZ-Fit Boot 87015, 87007	NFPA 1991 (2005 Ed) VPS–OIL–01–Variant 03	\$52	●	●	◐	●	●	●	◐	●	●	●	○	●	◐
7*	Pro Warrington Technical Rescue/EMS Boot Model 6000	NFPA 1992 (2005 Ed) (SEI)	\$250	○	◐	◐	○	●	●	⊗	●	◐	◐	●	○	●
8	Tingley HazProof 82330	NFPA 1991 (2005 Ed) VPS–TIN–01	\$56	●	●	◐	●	◐	●	◐	◐	◐	●	◐	◐	◐
9	Weinbrenner Thorogood Neoprene Rubber Structural and Haz-Mat Fire Boot 807–6004	NFPA 1992 (2005 Ed) SA11764	\$95	◐	●	◐	○	●	●	◐	●	◐	◐	●	●	◐
17	AirBoss-Defense CBRN Fire Boot “The BOSS” 4098	NFPA 1971 (2000 Ed) .SA9427		○	⊗	◐	●	●	◐	◐	◐	◐	◐	◐	⊗	●
OVERBOOTS —Footwear designed to wear over primary footwear that offers additional permeation/penetration protection																
10	AirBoss Lightweight Overboot (ALO) 8430–99–869–0394		\$40	●	●	◐	○	●	◐	◐	●	◐	◐	●	◐	◐
11	North SF Chem Overboot 11095		\$18	◐	⊗	◐	○	⊗	○	◐	○	◐	●	●	◐	◐
12	North Servus Black Vinyl Overshoe C43995		\$25	◐	○	◐	○	●	○	○	○	◐	◐	●	◐	●
13	Onguard Strapper Overboot 87050		\$51	⊗	◐	◐	○	◐	○	◐	◐	◐	◐	●	●	●
14	Onguard Chemical Overshoe 87025		\$30	⊗	◐	◐	○	◐	○	◐	◐	◐	◐	●	●	●
15	Paul Boyé Overboots SURBOEXP		\$25	●	●	◐	○	◐	○	●	◐	◐	○	●	●	○
PROTECTIVE LINER —Footwear worn under primary footwear that offers additional comfort and barrier protection																
16	Lanx Chemical Protective Boot Liner CPU–BL		\$38	○	○	◐	○	●	○	○	●	◐	◐	●	◐	◐

*Component of NFPA 1994 Class 2 and 1992 (2005 Edition) ensembles.

†Component of several NFPA 1994 Class 1, Class 2, and Class 3 ensembles.

‡Component of NFPA 1994 Class 3 ensemble.

4.4 Protective Gloves

Protective gloves capable of providing the wearer with protection from CBRN threats were identified and evaluated in this guide. Section 4.4.1 provides the findings of the market survey. Section 4.4.2 lists selection factors that were developed for evaluating protective gloves, and section 4.4.3 details the evaluation results for the protective gloves.

4.4.1 Market Survey

An extensive market survey was conducted to identify commercially available protective gloves. The market survey consisted of a solicitation of manufacturers, the review of previously conducted market surveys, literature searches, and consultation with SMEs. In order to provide detailed information on each glove item, 36 data fields, to correspond to the vendor questionnaire, were identified. These data fields were developed by SMEs and approved for distribution by the government. Definitions for the protective gloves data fields are provided in appendix H.

The market survey resulted in the identification of 39 protective gloves. The data sheets, along with an index alphabetically identifying each of the protective gloves by manufacturer, item name, and page number for the data sheets, are included in appendix I. Table 4–8 details the number of CB protective gloves identified for each of 16 vendors that were included in the market survey. Gloves are categorized by thickness (8 mil or less, 9 mil to 17 mil, and 18 mil or thicker). In addition, gloves that offer fire resistance are identified. It is important to note that some glove liners are included in the 8 mil or less column.

Table 4–8. Protective glove vendors

Vendor	8 mil or less	9 to 17 mil	18 mil or Thicker		Total
			No Flame Resistance	Flame Resistance	
AirBoss Engineering Products, Inc.			1		1
Ansell Healthcare	1		1	2	4
Best Manufacturing Company		3	4		7
Guardian Manufacturing Company	1	1	3		5
Gentex				1	1
Jomac/Bemac				1	1
Kimberly Clark	1				1
Lanx Fabric Systems	1				1
North Safety Products	2	4	3		9
Paul Boyé			2		2
Perfect Fit Glove Company				1	1
Saint-Gobain Corporation				1	1
Shelby Specialty Gloves				1	1
Talleyrand Industries		1			1
Total Fire Group				1	1
W. L. Gore & Associates, Inc.	1			1	2
Total	7	9	14	9	39

In some cases, first responders may elect to layer between two and three gloves in order to gain additional protection. A two-layer glove system has an outer protective glove and an inner barrier glove. The thicker, heavier outer layer offers the first barrier against chemical and physical protection; the thinner, more flexible inner layer offers additional penetration resistance. A three-layer glove system has an over glove for physical protection against abrasions, cuts, and tears; an outer/middle protective glove for physical protection and barrier/penetration protection against liquid, gaseous, and vaporous chemicals; and an inner protective glove to offer additional permeation/penetration protection. Some ensemble manufacturers have laminated the inner glove to the outer glove for a more comfortable fit as well as the protective attributes of a two-glove system. Some glove systems, especially those used for NFPA 1992 (2000 Edition) scenarios, use an additional knit or Kevlar over glove designed to protect hands from the sharp edges of metals, ceramics, glass, and other materials. Some responders prefer to wear layers of a thinner, tighter fitting glove over the outer glove to attain a snugger fit on the hand and to increase dexterity, as well as to give the responder the additional capability of removing and discarding the thinner latex glove without contaminating the thicker outer glove.

A two-layer glove system is typically the glove element of the NFPA 1994 Class 3 certified ensembles and selected NFPA 1994 Class 1 and NFPA 1994 Class 2 ensembles. The two layers are the thicker chemical protective glove and the thinner chemical barrier glove. A two layer glove system used with a NFPA 1994 class 1 certified ensemble includes the North Viton outer glove and the Silvershield-SSG inner glove, both from North Safety Products (fig. 4-19).



Figure 4-19. Viton outer glove and Silvershield-SSG inner glove, North Safety Products

A two-layer glove system used with a NFPA 1994 Class 3 certified ensemble includes the Neoprene outer glove and the Ansell Barrier inner glove from Ansell Healthcare (fig. 4-20).



Figure 4–20. Neoprene outer glove and Barrier inner glove, Ansell Healthcare

A three-layer glove system is normally the glove element of the NFPA 1994 Class 1 and/or a NFPA 1991 (2005 Edition) as well as selected NFPA 1994 Class 2 and/or a NFPA 1992 (2005 Edition) certified ensembles. The three layers are the over/outer physical protection glove, the outer/middle first line chemical protection glove, and the inner barrier glove.

To protect hands from heat and flame, one NFPA 1992 (2005 Edition) certified ensemble manufacturer suggests outer gloves suitable for thermal protection, such as those compliant with NFPA 1971 or NFPA 1951, and intermediate chemical barrier glove for additional chemical protection, such as an Ansell Barrier® or North Silvershield™, should be worn over an inner, cotton or knit Kevlar® glove.

One three-layer glove system used with NFPA 1994 class 1 and NFPA 1991 (2005 Edition) certified ensembles has an outer glove, the Kevlar Glove, from Perfect Fit Glove Company (fig. 4–21); a middle glove, the Chloroprene Rubber Glove from Guardian Manufacturing Company (fig. 4–22); and an inner glove, the Barrier Liner from Ansell Healthcare (see fig. 4–20).



Figure 4–21. Kevlar Glove, Perfect Fit Glove Company



Figure 4–22. Neoprene Rubber Glove, Guardian Manufacturing Company

Two examples of over gloves that are certified as stand-alone gloves to the NFPA 1992 (2005 Edition) standard are the ONEGlove™ Hazmat glove, from Saint-Gobain Corporation

(fig. 4–23) and the GORE™ Chempak® Ultra Barrier Glove System, from W.L. Gore and Associates, Inc. (fig. 4–24). Each of these gloves is also an element of a specific NFPA 1992 (2005 Edition) certified ensemble.



Figure 4–23. ONEGlove™, Saint-Gobain Corporation



Figure 4–24. GORE™ Chempak® Ultra Barrier Glove System, W.L. Gore and Associates, Inc.

4.4.2 Selection Factors for Protective Gloves

An initial set of selection factors for protective gloves emerged from the review of the *Guide for the Selection of Personal Protective Equipment for Emergency First Responders* (NIJ Guide 102–00) as well as the *Report on the Market Survey and Assessment of Alternative and Supplemental Personal Protective Equipment*. These factors were then shared with experienced scientists and engineers who have multiple years of experience in PPE, domestic preparedness, and identification of emergency first responder needs. The factors were also shared with the emergency first responder community in order to get their thoughts and comments. The selection factors were modified to eliminate some of the initial criteria, include new criteria, and expand several definitions.

These factors were developed to allow for a quick comparison of commercially available protective glove items. *It is important to note that the evaluation conducted using the selection factors was based solely upon vendor-supplied data and no independent evaluation of equipment was conducted in the development of this guide.* The vendor-supplied data can be found in its entirety in appendix H.

The results of the evaluation of the protective gloves are provided in section 4.4.3. The remainder of this section defines each of the selection factors. Details on the manner in which the selection factor was used to assess the glove items are included within the selection factor definition.

4.4.2.1 NFPA Certification

This selection factor indicates the NFPA certification associated with the protective glove. The three possible certifications include the following standards:

- NFPA 1991 Standard (2005 Edition).
- NFPA 1992 Standard (2005 Edition).
- NFPA 1994 Standard (2001 Edition).

The Safety Equipment Institute (SEI) numbering system takes one of the following three forms:

- CBT-XXX-XX.
- VPS-XXX-XX.
- LPS-XXX-XX.

The acronyms, CBT, VPS, and LPS represent the NFPA classification, where CBT stands for chem/bio protection; VPS stands for vapor protection; and LPS stands for liquid/splash protection. The middle three numbers represent the manufacturer. The last two numbers represent the approval number that SEI has assigned to a specific ensemble. NFPA 1994 certification numbers are preceded by CBT, NFPA 1991 certification numbers are preceded by VPS, and NFPA 1992 certification numbers are preceded by LPS.

The UL numbering system takes the following form: MHXXXXX.

The certification number is included in the evaluation table in section 4.3.3.

4.4.2.2 Market Price

Market price details the cost associated with the protective glove. The price indicated is the commercial price associated with the glove at the time that this guide was published. This price is not a special government price.

4.4.2.3 Chemical Agents Protected Against

This selection factor addresses the ability of the glove to protect against vapor, liquid, and aerosol forms of CAs. For this process, CA threats are primarily nerve agents such as GB and VX, and vesicants such as HD. Blood agents and choking agents are considered to be TICs/TIMs. Special consideration will be given to protective gloves with existing test results.

CAs Protected Against	
●	NFPA 1994 Class 1 and NFPA 1991 (2005 Edition)
◐	NFPA 1994 Class 1 CA permeation resistance (100 g/m ²)
◑	NFPA 1994, Class 3 CA permeation resistance (10 g/m ² , open top)
◒	NFPA 1994, Class 2 CA permeation resistance (10 g/m ² , closed top)
○	Does not meet requirements
⊗	Not specified

4.4.2.4 Biological Agents Protected Against

This selection factor addresses the ability of the glove to protect against BAs. BAs include threats such as bacteria (i.e., anthrax), rickettsia (i.e., typhus), toxins (i.e., botulinum toxin), and viruses (i.e., smallpox). Materials testing is not conducted with specific biological threat agents or their simulants. Protection from biological threats is implied as a result of passing permeation/penetration and ensemble inward leakage testing. A liquid penetration test is, however, used in screening against biological liquids for 1994. Special consideration will be given to validated materials and equipment testing results conducted using particulate and aerosol threat simulants.

BAs Protected Against	
●	NFPA 1994 Class 1 BA permeation resistance (100 g/m ²)
◐	Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats)
◑	NFPA 1994 Class 3 BA permeation resistance (10 g/m ² , open top)
○	Does not meet requirements
⊗	Not specified

4.4.2.5 Toxic Industrial Chemicals/Toxic Industrial Materials

This selection factor describes the ability of the glove to protect against TICs/TIMs. Special consideration will be given to validated performance results for product tested against the battery of chemicals required in NFPA 1994, 1991, and 1992. The NFPA 1994 battery of industrial chemicals calls for dimethyl sulfate, ammonia, chlorine, cyanogen chloride, carbonyl chloride, and hydrogen cyanide. The barrier performance against the NFPA battery of 21 chemicals specified in ASTM F 1001, *Standard Guide of Chemicals to Evaluate Protective Clothing Materials*, will also be given special consideration.

TICs/TIMs Protected Against	
●	Meets NFPA 1994 Class 1 and NFPA 1991 (2005 Edition) plus additional chemical threats
◐	Meets NFPA 1994 Class 1 plus NFPA 1991 (2005 Edition) ASTM F 1001 battery of 21 chemicals
◑	Meets NFPA 1994 Class 1 liquid/gases permeation resistance requirements; or meets NFPA 1991 (2005 Edition) ASTM F1001 battery of chemicals
◒	Meets NFPA 1992 (2005 Edition) modified ASTM F1001 battery of 7 chemicals (penetration resistance only)
○	Provides permeation resistance for some chemicals
⊗	Not specified

4.4.2.6 Radiological/Nuclear

This selection factor indicates if the protective gloves can protect against radiological particulates. Only those gloves certified to NFPA 1991 (2005 Edition) will be noted as having a radiological particulate protection capability.

Radiological/Nuclear	
●	The glove has the capability to provide protection against radiological particulates
○	The glove does not provide protection against radiological particulates
⊗	Not specified

4.4.2.7 Duration of Protection

Duration of protection indicates the length of time the glove provides adequate protection. Since duration varies depending on the concentration of agent, type of agent, test method, and environmental conditions, duration will be given with respect to specific conditions. The NFPA 1994 duration of protection requirement is 60 min.

Duration of Protection	
●	≥2 h
◐	≥60 min but <2 h
◑	<60 min
⊗	Not specified

4.4.2.8 Durability

Durability addresses the physical strength of the glove by describing a glove's tear, cut, puncture, and abrasion resistance. This selection factor also includes a glove's resistance to degradation from petroleum, oils, and lubricants (POLs). Glove Durability Performance measures (Reference NFPA 1994 Paragraphs 7.1.3.2 & 3 and 7.3.3.4 & 5)

- Class 1: Cut Resistance Test (ASTM F1790) 90 g load not less than 25 mm travel
- Class 1 & 3: Puncture Resistance Test (ASTM 1342) not less than 22N

Durability	
●	Meets 2 standards (ASTM F1790 and ASTM 1342)
◐	Meets 1 of 2 standards (ASTM F1790 or ASTM 1342)
○	Has not been tested
⊗	Not specified

4.4.2.9 Environmental Conditions

This factor indicates whether the equipment is designed for use in all common outdoor weather conditions and climates (e.g., rain, snow, extreme temperatures, and humidity) or only under relatively controlled conditions. This selection factor focuses on glove performance during hot weather and cold weather.

Class 1 & 3: Cold Temperature Performance Test (ASTM D 747) with a Bending moment 0.057 N-m at 60° angular defection @ -25 °C (-13 °F).

Environmental Conditions	
ASTM 747 cold weather performance—NFPA 1994 Paragraphs: 7.1.3.4 (C-1) & 7.3.3.6 (C-4)	
●	Glove has been tested and meets cold performance standard (ASTM 747)
◐	Glove has not been tested against the cold performance standard (ASTM 747)
◑	Glove has been tested and meets independent cold performance standards
○	Glove has not been tested against cold performance standards
⊗	Not specified

4.4.2.10 Grip Texture

This selection factor refers to how well objects can be gripped while wearing a specific glove. The user community expressed that overall comfort is highly desired, but grip texture would be a bonus feature on a comfortable glove. Attributes include textured gripping, rounded fingertips, and comparable performance under wet and dry conditions.

Grip Texture	
●	Glove has three attributes (textured gripping, rounded fingertips, comparable performance under wet and dry conditions)
◐	Glove has two of the three attributes
◑	Glove has one of the three attributes
○	Glove has smooth finish
⊗	Not specified

4.4.2.11 Dexterity/Mobility (Ease of Use)

Dexterity refers to the ability to manipulate fine instruments and pick up fine objects. These tests are based upon a set performance reduction compared to bare hand control. Performance reduction is based on a percent decrease in manipulation while wearing the gloves compared with bare hand control. The scale ranges from 200 % to 450 % to 600 %. These values compare to NFPA 1994 Class 3, 2, and 1, respectively. *The dexterity performance reduction (%) is based on ASTM F 2010 Test Method—part of NFPA 1991, 1992, and 1994 standards.*

Dexterity/Mobility (Ease of Use)	
●	Percent decrease less than 200 %
◐	Percent decrease less than 450 %
◑	Percent decrease less than 600 %
⊗	Not specified

4.4.2.12 Gauntlet Length

NFPA 1994 (paragraph 6.3.2) requires that a protective glove must extend at least one inch beyond the wrist crease. This selection factor will focus on the glove lengths beyond the wrist crease. This selection factor is only applicable to the level B protective glove evaluation model since the level A gloves are secured to the suit. Gauntlet length can be important when the level B glove is taped to this suit. If the gauntlet length is too short, the glove may cause the responders' arms to be restricted when taped to the level B suit.

Gauntlet Length	
●	≥4 inches above wrist
◐	≥2 inches above wrist
◑	1 in above wrist
◒	<1 inch above wrist
⊗	Not specified

4.4.2.13 Ease of Entry and Exit

This selection factor is concerned with the ability to enter and exit the glove (that is secured to the ensemble) while in the full encapsulated suit. Removing one's hand from this outer glove to activate communications equipment or to adjust one's equipment may be necessary and thus warrant ease exiting from and entering into the glove. As a result this selection factor is applicable to the level A protective glove evaluation model only.

Ease of Entry and Exit	
●	Glove has integral liner or does not require a liner
○	Glove must be taped to the garment
⊗	Not specified

4.4.2.14 Shelf Life

This selection factor will consider the length of time an unopened package of gloves can be reasonably stored under normal storage conditions without compromising the effectiveness of the gloves.

Shelf Life	
●	Shelf life ≥15 yr; requires nothing more than normal storage conditions
◐	Shelf life ≥10 yr; requires nothing more than normal storage conditions
◑	Shelf life ≥5 yr; nothing more than normal storage conditions
◒	<5 yr; or requires extraordinary storage conditions
⊗	Not specified

4.4.2.15 Sizes Available

Sizes available refer to the variety of sizes available to the first responder community. There should be enough sizes to adequately fit most of the members of the response team, both male and female. One-size-fits-all may be attractive for certain items but may not serve the responder community that is made up of diverse personnel. The NFPA 1994 Standard requires at least five (5) glove sizes.

Sizes Available	
●	More than 7 sizes
◐	5 sizes or 6 sizes
◑	3 sizes or 4 sizes
◒	2 sizes
○	One size fits all
⊗	Not specified

4.4.3 Evaluation Results

The evaluation results for the protective gloves are presented in tabular format for the 39 items identified during the development of this guide. The protective gloves are grouped according to their material thickness. For this report, gloves with a material thickness ≥ 18 mil offer the first line of cut, puncture, flame, and primary permeation/penetration protection; gloves with material thickness between 8 mil and 18 mil also offer some degree of cut, puncture, flame, and permeation/penetration protection; and gloves with material thickness of 8 mil or less offer additional permeation/penetration protection. Because the gloves identified for this guide were limited to gloves that offer some level of chemical protection, glove material was not considered in determining the protective qualities of the gloves. Within these categories, the NFPA certification status for each protective glove is identified along with the market price of each item. The table includes the specific glove item and the symbol that corresponds to how it was characterized based on each of the selection factor definitions. The results of categorizing the CB protective gloves are presented in table 4–9 and of categorizing the flame-resistant protective gloves in table 4–10.

Twenty-four protective gloves with thicknesses greater than 18 mil were identified in the development of this guide. Fourteen of these gloves offer essential structural and barrier protection against CA, BA, TICs/TIMs; and six of these 14 gloves have been certified as a glove element of an NFPA certified ensemble. Seven of these gloves are considered over gloves and offer the added cut, puncture, flame, and limited chemical protection requirements but do not have CBRN protective capabilities; and five of these seven gloves have been certified as a glove element of an NFPA certified ensemble. Three of these gloves are complete glove systems that have the benefit of several layers that must be worn together as a system, or laminated together into one glove. Two of the glove systems have been certified as a glove element of an NFPA certified ensemble, as well as stand-alone gloves meeting NFPA 1992 (2005 Edition) standards.

Nine protective gloves with thicknesses between 8 mil and 18 mil were identified in the development of this guide. Three of these gloves have been certified as a glove element of an NFPA certified ensemble.

Seven gloves with thicknesses less than 8 mil were identified in the development of this guide. Four of these gloves were certified as glove elements of NFPA certified ensembles, and one has been certified as a stand-alone glove, meeting NFPA 1999 (2003 Edition) standards.

One protective liner was identified in the development of this guide. It is not used with a certified ensemble.

Table 4-9. CB protective glove evaluation results

	Brand & Model	NFPA Certification	Thickness (mil)	Market Price	Capabilities & Features												
					CAs	BAs	TICs/TIMs	Rad/Nuclear	Duration	Durability	Environment	Grip Texture	Dexterity	Ease of Entry	Shelf Life	Sizes	Gauntlet
GLOVES GREATER THAN 18-MIL W/O FLAME RESISTANCE																	
1	Ansell Unsupported, Neoprene Glove 29-865, 29-845	NFPA 1994 Class 3	18	\$5.30	☐	☐	☐	○	●	●	●	☐	●	●	●	☐	●
2	AirBoss Molded Glove AMG		22	\$30	☐	●	☐	○	●	●	☐	☐	☐	●	☐	●	
3	Best Nitri Solve Glove 737, 747	NFPA 1992 (2005 Ed) MH30026	22	\$5.30	☐	☐	☐	○	●	○	○	☐	☐	○	☐	●	
4	Best Neoprene Chloroflex Glove 1823, 723, N8	NFPA 1992 (2005 Ed) MH30026	22, 28, 30	\$12.70	☐	☐	☐	○	●	○	○	☐	☐	○	☐	●	
5	North Butyl Glove B254GI, B224GI		22, 25	\$53	○	☐	○	○	●	●	☐	☐	⊗	●	☐	●	
6	North Butyl/Neoprene Glove BNI243APM	NFPA 1994 Class 1 NFPA 1994 Class 2	24	\$43	☐	☐	☐	○	●	⊗	☐	⊗	⊗	●	☐	●	
7	North Interlock Glove B254SSG		24	\$55	☐	☐	○	○	●	●	○	⊗	⊗	●	☐	●	
8	Guardian Chemical Protective Butyl Rubber Glove CP-25, CP-25R	NFPA 1994 Class 1	25	\$32.60	☐	●	☐	○	●	☐	☐	●	☐	●	☐	●	
9	Paul Boyé Piercan Glove L 1330 B 6/10	NFPA 1994 Class 3	25	\$40	☐	☐	☐	○	⊗	●	●	☐	●	●	☐	●	
10	Paul Boyé Butoeject Gloves				☐	☐	☐	○	⊗	●	●	☐	●	●	☐	●	
11	Best Butyl Butyl Heavyweight Glove 878		30	\$30	☐	☐	☐	○	⊗	⊗	○	☐	☐	○	☐	●	
12	Guardian Chemical Protective Neoprene Rubber Glove IN-35 (35A)	NFPA 1994 Class 1 NFPA 1991 (2005 Ed)	35	\$35.92	●	●	●	●	☐	●	○	☐	☐	⊗	☐	●	
13	Guardian Standard X-Heavy Butyl Glove IB-35		35	\$41.55	☐	●	☐	○	●	☐	☐	●	⊗	●	☐	●	
14	Best Viton Heavy-Weight Glove 890		39	\$199	☐	☐	☐	○	⊗	○	○	⊗	⊗	○	☐	●	

Table 4-9. CB protective glove evaluation results—Continued

	Brand & Model	NFPA Certification	Thickness (mil)	Market Price	Capabilities & Features												
					CAs	BAs	TICs/TIMs	Rad/Nuclear	Duration	Durability	Environment	Grip Texture	Dexterity	Ease of Entry	Shelf Life	Sizes	Gauntlet
GLOVES BETWEEN 8 MIL AND 18 MIL																	
15	North Viton® Glove F101		10	\$71.00	○	◐	○	○	●	◐	○	◐	◐	●	◐	◐	◐
16	Best Viton Medium-Weight Glove 892		12	\$54.50	◐	◐	◐	○	⊗	○	○	⊗	⊗	○	◐	◐	●
17	North Butyl Glove B131		13	\$13.50	◐	●	◐	○	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
18	Best Butyl Glove 874, 874R		14	\$17	◐	◐	◐	○	⊗	○	○	◐	◐	○	◐	◐	●
19	Guardian CP Butyl Rubber Glove CP-14		14	\$18.37	◐	●	◐	○	●	◐	◐	●	◐	◐	◐	◐	●
20	North Butyl Glove B174, B144GI		14, 17	\$53	◐	●	○	○	●	●	◐	◐	●	◐	◐	◐	●
21	Best Nitri Solve Glove 717, 727, 730	NFPA 1992 (2005 Ed) MH30026	15	\$5.30	◐	◐	◐	○	●	○	○	◐	◐	○	◐	◐	●
22	North Nitrile Glove LA172G		17	\$2.60	⊗	●	⊗	○	●	⊗	○	◐	◐	●	◐	◐	●
23	Tallyrand Industries HyTrial Nitrile Glove 18-NDFB-7	NFPA 1994 Class 3	18	\$35.38	⊗	⊗	⊗	○	⊗	⊗	⊗	⊗	⊗	⊗	⊗	◐	⊗
GLOVES LESS THAN 8 MIL																	
24	W.L. GORE™ CHEMPAK® Glove Liner G9492-C2, C3	NFPA 1992 (2005 Ed) NFPA 1994 Class 2	1		◐	◐	◐	○	⊗	⊗	⊗	⊗	●	⊗	⊗	⊗	⊗
25	Ansell Flat-Film, Hand-Specific, Non-Woven Liner 2-100	NFPA 1994 Class 1 NFPA 1994 Class 3 NFPA 1991 (2005 Ed)	2.5	\$6.37	●	●	●	●	⊗	●	◐	●	●	●	◐	◐	○
26	North Silvershield™/4H® Glove SSG	NFPA 1994 Class 1 NFPA 1994 Class 2 NFPA 1992 (2005 Ed)	2.7	\$5.15	◐	●	●	○	●	○	○	◐	●	●	◐	◐	◐
27	Kimberly-Clark Safeskin* Purple Nitrile-Xtra* Exam Gloves 55090	NFPA 1994 Class 3 & NFPA 1994 Class 3 MH29808 stand alone	4.7	\$0.85	◐	◐	◐	○	⊗	⊗	⊗	⊗	●	⊗	⊗	⊗	⊗
28	Lanx CP Glove Liner CPU-GL		4.7	\$38	⊗	⊗	⊗	○	●	○	○	⊗	●	⊗	◐	◐	●
29	Guardian CP Butyl Rubber Glove CP-7		7	\$8.36	⊗	⊗	⊗	○	◐	◐	○	◐	●	●	◐	◐	●
30	North Butyl Glove B074GI		7	\$53	◐	●	○	○	●	●	◐	◐	●	◐	◐	◐	●

Table 4-10. Flame-resistant protective glove evaluation results

	Brand & Model	NFPA Certification	Thickness (mil)	Market Price	Capabilities & Features												
					CAs	BAs	TICs/TIMs	Rad/Nuclear	Duration	Durability	Environment	Grip Texture	Dexterity	Ease of Entry	Shelf Life	Sizes	Gauntlet
GLOVES GREATER THAN 18 MIL W/ FLAME RESISTANCE																	
31	Ansell Gold Knit Kevlar® 70-225*	NFPA 1994 Class 1 NFPA 1994 Class 2 NFPA 1992 (2005 Ed)		\$10	☐	●	○	☐	☒	☒	☒	☒	☒	☒	☒	☐	☒
32	Ansell Edmont Kevlar® #K2300-12	NFPA 1994 Class 1 NFPA 1991 (2005 Ed)		\$10	●	●	●	●	☒	☒	☒	☒	☒	☒	☒	☒	☒
33	Gentex Lifetex™ Products NBC Vapor Protective Gloves				☒	☒	☒	○	☒	☒	☒	☒	☒	☒	☒	☒	☒
34	JOMAC Kevlar® Plus 1804NBC	NFPA 1994 Class 2		\$6.50	☐	☐	☐	○	☒	☒	☒	☒	☒	☒	☒	☐	☒
35	Perfect Fit Kevlar Glove KV18AJTC*	NFPA 1992 (2005 Ed) NFPA 1994 Class 1 NFPA 1991 (2005 Ed)		\$10.50	●	●	●	●	☒	☒	☒	☒	☒	☒	☒	☒	☒
36	Saint-Gobain ONEGlove 22402M (NFPA 1991 2005)	NFPA 1994 (2001 Ed) CBT-GP-03 NFPA 1992 (2005 Ed) LPS SGP 02 NFPA 1991 (2005 Ed) VPS-SGP-04	80	\$65	●	●	●	●	○	●	●	○	●	●	☐	☐	●
37	Shelby Proximity Gloves 5200	NFPA 1976 (2000 Ed)		\$102	○	☐	☐	○	☒	☒	☒	☒	☒	☒	☒	☐	☒
38	Total Fire Group Proximity Gloves GL-BPR-RWA	NFPA 1976 (2000 Ed)		\$62	☒	☒	☒	○	☒	☒	☒	☒	☒	☒	☒	☒	☒
39	GORE™ Chempak® Ultra Barrier Glove System	NFPA 1994 Class 1, Class 2, Class 3 NFPA 1992 (2005 Ed) SEI stand alone		\$79	☐	☐	☐	○	●	●	●	☐	●	●	●	☐	●

5. APRS, PAPRS, SCBAS, AND ESCAPE RESPIRATORS

In the context of PPE, respiratory protection systems or respirators provide protection by preventing inhalation of harmful airborne substances and/or providing breathable air in an oxygen-deficient atmosphere. As discussed in section 4, the approach in selecting PPE must encompass an “ensemble” of clothing and equipment items that are easily integrated to provide an appropriate level of protection while still allowing one to carry out activities involving hazardous materials. Respiratory equipment, which is generally purchased separately from the ensemble, is discussed in the remainder of this section.

Four types of respiratory equipment are addressed in this guide. These include the APR, the PAPR, the SCBA, and escape respirators. Each type of respirator is explained in section 5. It is important to note that the other ensemble components (i.e., protective garments, footwear, and gloves) are discussed in section 4. In addition, MCC is discussed in section 6.

5.1 Air-Purifying Respirators

The function of an APR is to protect the wearer from harmful contaminants before the air is breathed. An APR is equipped with a canister or cartridge mounted on the mask to remove specific air contaminants by filtering, adsorbing, absorbing, or chemical reaction. Air purifying respirators are either APRs or PAPRs. APRs use the breathing action of the wearer to draw air through the filter element and are considered negative pressure respirators. PAPRs (discussed in sec. 5.2) use blowers powered by batteries to force ambient atmosphere through the filter elements and are considered positive pressure respirators.

A CBRN APR provides a specified level of respiratory protection when used during entry into non-IDLH CBRN atmospheres. The CBRN APR can also be used to escape from IDLH concentrations that may unpredictably occur as a result of a secondary device, unidentified agent entrapment, or similar causes for sudden increases of concentrations.

CBRN canisters contain filters for removal of both biological aerosols and chemical gases/vapors. A High Efficiency Particulate Air (HEPA) filter is included for removing aerosols and microbiological agents such as bacteria, fungi, and viruses. A granular sorbent bed (e.g., military grade ASZM-TEDA impregnated activated carbon) removes chemical agents in the gas or vapor phase such as CK (cyanogen chloride), GB, and V agents. The canister labels specify the CBRN protection duration (CBRN Cap 1, CBRN Cap 2, or CBRN Cap 3). A canister with a CBRN Cap 1 duration indicates that the canister meets a minimum 15 min test requirement. CBRN Cap 2 and Cap 3 correspond to 30 min and 45 min, respectively.

APRs capable of providing the wearer with respiratory protection from CBRN threats were identified and evaluated in this guide. Standards and requirements associated with APRs are discussed in section 5.1.1. Section 5.1.2 provides the findings of the market survey. Section 5.1.3 lists selection factors that were developed for evaluating APRs, and section 5.1.4 details the evaluation results for APRs.

5.1.1 Standards and Requirements

NIOSH, under the authorization of the Federal Mine Safety and Health Act of 1977 and the Occupational Safety and Health Act of 1970, provides a testing approval and certification program assuring commercial availability of safe personal protective devices to include respiratory protection devices. NIOSH develops improved performance regulations, tests and certifies (or approves) devices, and purchases approved and certified products on the open market to verify quality of the respirator.

NIOSH is currently testing and certifying APRs for use by emergency responders in atmosphere that contain CBRN respiratory hazards. Requirements for industrial respirator certification are included under the following regulation:

Code of Federal Regulations
Title 42–Public Health
Part 84–Approval of Respiratory Protection Devices
Subpart I–Gas Masks

The CBRN–based standard associated with CBRN APRs is covered by the *Statement of Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Full Facepiece Air-Purifying Respirator (April 2003)*.

APRs Certified to the NIOSH CBRN Standard must meet the minimum requirements identified in the following:

- 42 CFR, Part 84, Subparts A, B, D, E, F, and G.
- 42 CFR, Part 84, Subpart I, Paragraphs 84.110–123.
- 42 CFR, Part 84, Subpart K, Paragraphs 84.170, 179, and 181.

Requirements for APRs certified to the NIOSH CBRN Standard include enhanced performance criteria for field of view, lens abrasion resistance, simulated carbon dioxide inhalation testing, canister gas life testing, fogging resistance, communications, resistance to CA penetration and permeation, facepiece fit factor testing, and environmental conditioning.

Additional details on the standard and a current list of NIOSH Certified CBRN APRs can be found at <http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnapproved/apr/default.html>.

Based on these standards, NIOSH has been able to test and certify APRs for use by emergency first responders in atmospheres that contain CBRN respiratory hazards. As of March 2006, eight APRs have been certified to CBRN APR standards and meet CBRN Cap 1 test requirements.¹⁹ These APRs are included in the following list:

¹⁹ <http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnapproved/apr/default.html#list>

- Avon Protection Systems CBRN FM12 Respirator.
- 3M™ FR-M40B.
- 3M™ FR-7800B Full Facepiece.
- Mine Safety Appliances Company (MSA) CBRN Ultra Elite Gas Mask.
- Mine Safety Appliances Company (MSA) Millennium® CBRN Gas Mask.
- North Safety Products CBRN APR 54500 Series.
- Scott CBRN/M120 APR.
- Survivair Respirators, Inc. Opti-Fit™ CBRN Gas Mask.

Details on the eight CBRN certified APRs, and the six other APRs, are included in the market survey (sec. 5.1.2) and the evaluation (sec. 5.1.4) sections.

5.1.2 Market Survey Results

An extensive market survey was conducted to identify commercially available APRs. The market survey encompassed the solicitation of manufacturers, the review of previously conducted market assessments, literature searches, and consultation with SMEs. In order to provide detailed information on each APR item, 46 data fields were identified. These data fields were developed by SMEs and approved for distribution by the government. Definitions for the APR data fields are provided in appendix J.

The market survey resulted in the identification of 12 APRs. The APR data sheets, along with an index identifying each of the APRs, are included in appendix K. Table 5–1 presents the number of APRs, to include those certified to the NIOSH CBRN Standard, identified for each of seven vendors that were included in the market survey.

Table 5–1. APRs identified for each vendor

Vendor	CBRN Certified	Non-CBRN Certified	Total
3M	2		2
Avon Protection Systems	1	2	3
Draeger		1	1
Mine Safety Appliances Company	2		2
North Safety Products	1		1
Scott Health & Safety	1	1*	2
Survivair Respirators, Inc.	1		1
Total	8	4	12

* Currently certified to NIOSH 42 CFR Part 84 as negative pressure respirators.

5.1.3 Selection Factors for APRs

An initial set of selection factors for APRs emerged from the review of the *Guide for the Selection of Personal Protective Equipment for Emergency First Responders* (NIJ Guide 102–00) as well as the draft *Report on the Market Survey and Assessment of Alternative and Supplemental Personal Protective Equipment*. These factors were then shared with experienced scientists and engineers who have multiple years of experience in PPE, domestic preparedness,

and identification of emergency first responder needs. The factors were also shared with the emergency first responder community in order to get their thoughts and comments. The selection factors were modified to eliminate some of the initial criteria, include new criteria, and expand several definitions.

These factors were developed to allow for a quick comparison of commercially available APRs. *It is important to note that the evaluation conducted using the selection factors was based solely upon vendor-supplied data and no independent evaluation of equipment was conducted in the development of this guide.* The vendor-supplied data can be found in its entirety in appendix K.

The results of the evaluation of the APRs are provided in section 5.1.4. The remainder of this section defines each of the selection factors. Details on the manner in which the selection factor was used to assess the APRs are included within the section factor definition.

5.1.3.1 NIOSH Approval

This selection factor indicates the NIOSH approval number associated with the APR. The approval numbers take the following form: TC-14G-XXXX.

The acronym “TC” stands for Testing/Certification. The “14G” is a schedule category that corresponds to gas masks. The last four numbers represents the approval number that NIOSH has assigned to a specific respirator. For those respirators having CBRN approval, an additional designation of “CBRN” is included in the evaluation table in section 5.1.4.

5.1.3.2 Market Price

The market price selection factor details the cost associated with the APR and a CBRN cartridge (if sold separately). The price indicated is the commercial price associated with the APR at the time that this guide was published. This price is not a special Government price.

5.1.3.3 Visor

This selection factor indicates if the APR is available with a single or dual ocular lens. The APRs are grouped in table 5-1 according to the visor type.

5.1.3.4 Hydration Capability

NIOSH CBRN standard permits approval of respirators equipped with hydration systems. The hydration system can be used during training exercises but is not permitted for use in the hot zone. Although hydration capability is considered an enhanced capability, factors that affect hydration include location of the mission, type of mission, length of mission, and the life of other equipment in use. The APRs are also grouped in table 5-1 according to their hydration capability.

5.1.3.5 Total Weight

The weight of the APR ensemble is based on the weight, fit, and feel associated with a donned and functioning APR. This selection factor considers the total weight of the working equipment/system, which includes the weight of the cartridge/canister.

5.1.3.6 Sizes Available

This selection factor refers to the variety of sizes available to the first responder community. There should be enough sizes to adequately fit most of the members of the response team, both male and female.

5.1.3.7 Field of View

This selection factor refers to the respirator's field of view as a percentage of the unmasked field of view. The criterion could also evaluate the peripheral and up/down field of view. An expected field of view is at least 70 % (NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0314).

5.1.3.8 Canister Mount

The canister mount is the location that the canister interfaces with the facepiece. The CBRN standard permits approval of two configurations: (1) facepiece-mounted and (2) non-facepiece-mounted (i.e., harness system with hose connecting to mask). The market survey conducted for this guide identified APRs that have facepiece-mounted canisters. The performance scale noted below is based upon facepiece canister mounting only. Keep in mind that canister mounting locations can affect the user's comfort and vision, as well as hinder communication.

Canister Mount	
●	Center, right, or left interchangeable
◐	Right and left cheek (interchangeable)
◑	Right or left cheek (factory set)
◒	Center mounted
⊗	Not specified

5.1.3.9 Facepiece Compatibility

This criterion indicates if the APR facepiece can be used with other types of respirators such as a PAPR or SCBA.

Facepiece Compatibility	
●	Facepiece is NIOSH certified for use, and can be used with a PAPR or SCBA
◐	Facepiece is NIOSH certified for use as an APR
◑	Facepiece not NIOSH certified for use, but can be used with a PAPR or SCBA
◒	Facepiece not NIOSH certified for use, or cannot be used with a PAPR or SCBA
⊗	Not specified

5.1.3.10 Inhalation Resistance

Inhalation resistance is the ease at which an APR wearer can breathe air. The NIOSH APR CBRN standard requires an inhalation resistance of less than 65 mm H₂O at 85 L/min. The CSTs currently use the M40 mask which will be used as a reference. The military specification for the M40 requires an inhalation resistance less than 55 mm H₂O.

Inhalation Resistance	
●	≤50 mm H ₂ O
◐	≤55 mm H ₂ O
◑	≤65 mm H ₂ O
◒	≥65 mm H ₂ O
⊗	Not specified

5.1.3.11 Exhalation Resistance

Exhalation resistance is the ease at which an APR wearer can exhale air. The NIOSH APR CBRN standard requires an exhalation resistance of less than 20 mm H₂O at 85 L/min. The military specification for the M40 requires an exhalation resistance less than 26 mm H₂O.

Exhalation Resistance	
●	≤15 mm H ₂ O
◐	≤20 mm H ₂ O
◑	≥20 mm H ₂ O
⊗	Not specified

5.1.3.12 Chemical-Specific Canister Options

This selection factor considers the availability of NIOSH approved canisters for specific TICs such as chlorine. This selection factor will also address what, if any, optional canisters are certified with a particular mask.

Canister-Specific Canister Options	
●	CBRN certified with 2 or more canisters
◐	CBRN certified with 1 canister
◑	No CBRN certified canisters
⊗	Not specified

5.1.4 Evaluation of APRs

The evaluation results for the APRs are presented in tabular format, table 5–2, for the 12 APRs identified at the time this guide was written. It is important to note that two of the three noncertified APRs meet NIOSH 42 CFR Part 84 industrial respirator requirements and all three APRs may be NIOSH CBRN certified in the future.

Table 5–2. APR evaluation results

ID Number	Brand and Model	NIOSH CBRN Approved	Market Price	Weight (g)	Sizes Available	Field of View	Canister Mount/Location	Facepiece Compatibility	Inhalation Resistance	Exhalation Resistance	Cartridges/Canister Options
SINGLE LENS WITH HYDRATION CAPABILITY											
1	Avon CBRN M53	No	\$1.2K [*]	689	XSML	85 %	☐	☐	●	●	1
2	Avon CBRN C50	No	\$300 [†]	800	SML	85 %	☐	☐	●	●	1
3	MSA Millenium ^{‡§} 10051286, 87, 88	TC-14G-0270CBRN	\$230	1051	SML	90 %	☐	●	●	☐	2
4	Scott CBRN/M120 APR	TC-14G-0283CBRN	\$218	860	SM/L	87 %	●	●	?	☐	2
5	Survivair Opti-Fit [™]	TC-14G-0272CBRN	\$269	1034	SML	88 %	●	●	●	☐	1
SINGLE LENS W/O HYDRATION CAPABILITY											
6	3M [™] FR-7800B [¶]	TC-14G-0271CBRN	\$272	935	SML	100 %	●	●	●	●	1
7	Dräger Safety CDR 4500	No	\$220	853	OFA	81 %	☐	☐	☐	☐	1
8	MSA Ultra Elite ^{‡§} 100527XX	TC-14G-0270CBRN	\$181	1196	SML	80 %	☐	●	●	☐	2
9	North Safety Products 54500 Series	TC-14G-0273CBRN		800	SL	96 %	●	●	☐	●	1
DUAL LENS WITH HYDRATION CAPABILITY											
10	Avon CBRN FM12 ^{**}	TC-14G-0275CBRN	\$275 [†]	770	SML	65 %	●	●	●	●	1
11	3M [™] FR-M40 [¶]	TC-14G-0271CBRN	\$318	1100	?	94 %	●	●	●	●	1
12	Scott CBRN/M110 APR	TC-14G-0283CBRN		1320	SL	84 %	☐	●	●	⊗	2

^{*} Price includes CBRN filter, voice amplifier, protective hood, carrier, clear outsert, and instruction manual.

[†] Price includes CBRN filter, carrier, and instruction manual.

[‡] MSA models share the same approval number.

[§]The facepiece is NIOSH certified to be used with the OptimAir 6A PAPR.

^{||}Scott models share the same approval number.

[¶]3M models share the same approval number.

^{**}The facepiece is NIOSH certified for use with a C420 PAPR.

Twelve APRs capable of providing CBRN protection were identified and evaluated for this guide. As of February 2006, nine of the 12 APRs have been certified to the NIOSH CBRN APR Standard. Descriptions of each APR included in this guide are provided in the remainder of this section. The descriptions are based on vendor-supplied data, which can be found in appendix J. The APRs are grouped by lens type and then by hydration capability.

5.1.4.1 Single Lens with Hydration Capability

Five of the APRs are designed with a single lens and also have hydration capability. Descriptions of each of the six APRs are provided in the remainder of this section.

5.1.4.1.1 Avon CBRN M53

The Avon CBRN M53 has not yet been submitted for NIOSH CBRN testing but is currently in production for DOD. The Avon CBRN M53 incorporates many of the features of the M50 full military specification NBC mask. It is constructed from agent resistant chlorobutyl/silicone blended rubber. The low-profile, 6-point harness provides compatibility with many in-service helmet systems, and the low-profile cheek and single filter provides optimum weapons sighting. The front module includes the primary speech module, the exhalation valve, and the drinks train with a dual valve and drink tube. The CBRN filter provides broad-spectrum capability in accordance with the NIOSH CBRN standard. Three different outserts to adapt the mask to the operational situation are available. Optional items include a lightweight NBC hood and a low-profile voice project unit. It also includes a variable resistance exhalation unit that allows it to function on its own, with a SCBA, or with a PAPR. One cartridge and one P100 filter are available. The facepiece is available in four sizes. Figure 5–1 shows the CBRN M53, from Avon Protection Systems.



Figure 5–1. CBRN M53, Avon Protection Systems

5.1.4.1.2 Avon CBRN C50

The Avon CBRN C50, currently NIOSH approved to 42 CFR 84 respirator, has been submitted for NIOSH CBRN testing. The Avon CBRN C50 is a modified version of the XM–50 full military specification NBC mask. Modifications include decreasing the number of canisters from two to one, which can be factory attached to either side of the facepiece; adding a threaded filter connection; enhancing the voice projection unit (VPU); and improving the hydration flow

with an on/off valve. The C50 is constructed from agent resistant chlorobutyl/silicone blended rubber. The low-profile, 6-point harness provides and the low-profile brow with extended chin cup offers a good fit with a range of CBRN suits and helmets to include riot, combat, and search and rescue. The front module includes the exhalation valve, speech module, and the drink system with a dual valve and drink tube.

The wide visor gives enhanced field of view and ensures minimal eye relief, improving weapons sighting. The CBRN C50 filter provides broad-spectrum capability in accordance with the NIOSH CBRN standard. A P100 filter is also available. The facepiece is available in three sizes (small, medium, and large). Figure 5–2 shows the CBRN C50, from Avon Protection Systems.



Figure 5–2. CBRN C50, Avon Protection Systems

5.1.4.1.3 MSA Millennium® CBRN Gas Mask

The MSA Millennium® CBRN gas mask received NIOSH CBRN certification on March 12, 2004. Its approval number is TC–14G–0270CBRN. The MSA Millennium® CBRN gas mask combines high performance, customized fit, comfort and cost efficiency in a version that is similar to the MSA military-style gas mask (MCU-2/P). The Millennium® has a flexible, one-piece polyurethane lens with a wide field of vision that is bonded to the durable Hycar rubber facepiece. A fully elastic, 6-point head harness allows easy on/off and adjustment, with no hair pulling. The CBRN canister contains chemical sorbents and a P100 filter to attract, retain, and neutralize contaminants and can be attached to either side of the facepiece. A drinking tube provides connection for fluid ingestion. An internal nose cup with two check valves deflects air from the lens and reduces fogging. A standard mechanical speaking diaphragm is included, or an optional ESP® II communications system can be added. Other accessories include an ESPII communications system, butyl-coated nylon hood, gas mask pouch, police style, spectacle kit, and lens outserts. The Millennium CBRN gas mask is designed to be used as a system, and while the thread and gasket meet the specifications of the standard, only MSA manufactured components are tested and certified as assemblies. The facepiece is available in three sizes (small, medium, and large). The facepiece is 42 CFR Part 84 NIOSH certified for use with a PAPR. Figure 5–3 shows the Millennium® CBRN gas mask, from Mine Safety Appliances Company.



Figure 5-3. Millennium[®] CBRN Gas Mask, Mine Safety Appliances Company

5.1.4.1.4 Scott CBRN/M120 APR

Scott's CBRN/M120 APR received NIOSH CBRN certification on March 24, 2006. Its approval number is TC-14G-0283CBRN. Scott's CBRN/M120 APR is designed specifically to protect personnel against CBRN and riot control agents. The CBRN/M120 APR has a Halo butyl elastomer facepiece material that offers resistance to chemicals and aging effects of ozone and high temperatures. The 40 mm canister can be attached to either side of the facepiece. When combined with the Enforcement cartridge, it is NIOSH approved for use against phosphine, CS, CN (tear gas), ammonia, chlorine, chlorine dioxide, formaldehyde, hydrogen chloride, hydrogen fluoride, methylamine, sulfur dioxide, or for escape only from hydrogen sulfide; and for use against all particulate aerosols. The CBRN/M120 APR offers an optional drinking device and a full facepiece spectacle kit that can be fitted with prescription lenses. Scott recommends the use of its Multi-Wash Mini²⁰ solution for the cleaning and disinfecting of the CBRN/M120 APR. Figure 5-4 shows the CBRN/M120 APR, from Scott Health & Safety.



Figure 5-4. CBRN/M120 APR, Scott Health & Safety

5.1.4.1.5 Survivair CBRN Opti-Fit™

The Survivair[®] Opti-Fit™ CBRN gas mask received NIOSH CBRN certification on January 31, 2005. Its approval number is TC-14G-0272CBRN. The Survivair[®] Opti-Fit™ CBRN gas

²⁰ The Multi-Wash Mini is a pre-measured iodine-based solution of both cleaning and disinfecting ingredients, eliminating the need to mix and measure disinfectants with water.

mask is based on the Opti-Fit full facepiece APR. The CBRN gas mask was developed specifically for first responders and provides respiratory protection from CBRN agents in addition to TIMs. It has an optically correct, single-piece polycarbonate lens that provides a wide field of vision. The Opti-Fit CBRN gas mask features a durable, chemical-resistant butyl rubber face skirt; three-position canister mounting; optional hydration drink tube; standard nose-cup; and 5-strap, silicone head harness. It is NIOSH approved with the Model 1690 CBRN Canister, NIOSH Cap 1. The facepiece is available in three sizes (small, medium, and large). Figure 5–5 shows the Opti-Fit™ CBRN Gas Mask, from Survivair Respirators, Inc.



Figure 5–5. Opti-Fit™ CBRN Gas Mask, Survivair Respirators, Inc.

5.1.4.2 Air-Purifying Respirators (Single Lens no Hydration Capability)

Four of the APRs are designed with single lenses but have no hydration capability. Descriptions of these four APRs are provided in the remainder of this section.

5.1.4.2.1 3M™ Full Facepiece FR-7800B

The 3M™ Full Facepiece FR–7800B received NIOSH CBRN certification on May 10, 2005. Its approval number is TC–14G–0271CBRN. It is approved to NIOSH CBRN requirements in conjunction with the 3M™ Canister FR–15– CBRN. This product is designed for first responder applications commonly found in law enforcement, fire, emergency response and medical environments. The facepiece design consists of a double-flange, face-sealing surface that 3M™ believes enhances fit and protection. In addition, the mask includes a speaking diaphragm for improved voice amplification and clarity. The canister can be mounted on either side of the APR. The APR is also NIOSH approved with 3M™ Canister CP3N for use against CS, CN, and with a P100 filter in riot conditions, including those with tear gas (non-CBRN). The facepiece is available in three sizes to accommodate most face sizes. Figure 5–6 shows the Full Facepiece FR-7800B facepiece, from 3M.



Figure 5–6. Full Facepiece FR-7800B Facepiece, 3M

5.1.4.2.2 Dräger Safety CDR 4500

The only requirement of the NIOSH CBRN Standard for APRs that Dräger Safety’s Panorama Nova APR does not meet is that it does not have a scratch-resistant lens. As a result, Dräger Safety designed the CDR 4500. Although the Dräger CDR 4500 mask has received NIOSH approval as a mask, it has not yet received NIOSH CBRN certification because it is waiting CBRN approval for the canister with which it will be used. The general description of the CDR 4500 mask is almost identical to the Panorama Nova except the CDR 4500 is only available in black. The mask body is available in EPDM (ethylene propylene dimonomer) or soft contouring silicone and can be gotten with a stainless steel lens retainer or with a black plastic retainer to reduce reflective surfaces. The mask has a centrally located cartridge connection, an installed nose cup, and a stainless steel speech diaphragm. The 5-point headstrap is infinitely adjustable. The Panorama Nova can be used with respiratory filters, compressed air- or closed circuit breathing apparatus, or a power-assisted filtering device. The Panorama masks accept the full range of Dräger filters, cartridges and canisters. Its triple edge sealing design provides fit and comfort in one size, i.e., three face sizes (small, medium, and large) fit with one Panorama mask. Accessories include a hairnet, a communication device, spectacle kits, and antifogging agents. The facepiece is NIOSH certified for use with a PAPR and has passed NFPA 1981 Standard for Open-Circuit SCBA for Fire and Emergency Services. In addition, a spectacle kit is offered for an extra charge. Figure 5–7 shows the Panorama Nova (a variety of the CDR 4500) from Dräger Safety.



Figure 5–7. Panorama Nova, Dräger Safety

5.1.4.2.3 MSA Ultra Elite® CBRN Gas Mask

The MSA Ultra Elite® CBRN Gas Mask received NIOSH CBRN certification on March 12, 2004. Its approval number is TC-14G-0270CBRN. The MSA Ultra Elite® CBRN Gas Mask is a soft black Hycar rubber facepiece that has a large lens with 83 % unimpeded vision. The facepiece is available with a 5-point rubber or Speed-ON® head harness. Both the inlet port and the mechanical speaking diaphragm are centrally located. Accessories include a voice amplifier, a butyl hood, cover lens (clear or tinted), and storage devices (pouch or case). The facepiece can provide service for more than 15 yr. The unopened CBRN canister has a 5 yr shelf life from the date of manufacture. The Ultra Elite Gas Mask is not limited to CBRN applications. With the use of the GME-P100 Canister or the Twin-Cartridge Adapter and GME-P100 cartridges, it is perfect for other applications as well. The facepiece is available in three sizes (small, medium, and large).

The Ultra Elite® CBRN Gas Mask uses a common platform facepiece for both APR and SCBA applications, allowing standardized training and eliminating redundant fit-testing. Although the SCBA and APR facepieces share a common sealing surface and common fit test, they also have design differences to meet the specific needs of their individual applications. For this reason, the MSA CBRN Ultra Elite Gas Mask is designed for dedicated use as an APR only and cannot be mistakenly interchanged with an SCBA. The facepiece is also NIOSH certified for use with the OptimAir 6A PAPR. Figure 5-8 shows the CBRN Ultra Elite Gas Mask, from Mine Safety Appliances Company.



Figure 5-8. CBRN Ultra Elite Gas Mask, Mine Safety Appliances Company

5.1.4.2.4 North Safety Products 54500 Series Gas Mask

The North 54500 Series Gas Masks received NIOSH CBRN certification on June 29, 2005. The approval number is TC-14G-0273CBRN. The North 54500 Series gas mask is black with a scratch and impact-resistant lens, an internal oral/nasal cup to reduce fogging, and a 4-strap head harness assembly. It has two 40 mm threaded connectors that accept a standard NATO/EN type threaded canister, enabling the user to choose one of the two inlet ports onto which a single CBRN canister could be attached. The other side is blocked with a removable plug. The North Safety Products 54500 Series consists of a full facepiece, a canister, an instruction manual, anti-fog wipes, a carry bag, and two poly-bags for facepiece and anti-fog storage. It does not have

hydration capability. The North 54500 Series Gas Mask is available in two overlapping sizes, small and medium/large.

The nonreflective black CBRN Canister provides respiratory protection against most hazardous CBRN agents provided there is sufficient oxygen present to support life. It does not provide protection from fire or carbon monoxide. Figure 5–9 shows the 54500 Series gas mask, from North Safety Products.



Figure 5–9. 54500 Series gas mask, North Safety Products

5.1.4.3 Air-Purifying Respirators (Dual Lens)

Three of the APRs are designed with a dual lens. Descriptions of each of these APRs are provided in the remainder of this section.

5.1.4.3.1 Avon FM12—the Global CBRN Respirator

The Avon CBRN FM12 received NIOSH CBRN certification on July 18, 2005. Its approval number is TC–14G–0275CBRN. The Avon CBRN FM12 is a full military specification NBC mask originally developed for military NBC style operations. It is constructed from agent-resistant chlorobutyl rubber providing high levels of respiratory protection against both classical CA and TIMs. The front module includes the primary speech module, the exhalation valve, and the drinks train with a dual valve and drinks tube allowing drinking from standard canteens and Camelbak® type systems. The low-profile, 6-point harness provides excellent comfort and compatibility with many in service helmet systems. Low-profile twin eyepieces ensure minimal eye relief, improving weapons sighting. Four of the six buckles are preadjusted when fitted with two being adjustable to allow quick donning and doffing. Available accessories include monacles (allows lens prescription to be mounted inside the mask), canteen with cap, Camelbak® bladder adapter, carriers, storage bag, and voice projection unit. The C420 PAPR powered respirator system for extended duration use is also available.

The CBRNF12 filter provides broad-spectrum capability in accordance with the NIOSH CBRN standard. A NIOSH approved CS/CN/P100 riot agents filter (CTF12) and the NATO NBC Filter (AMF12) are also available. The facepiece is available in three sizes (small, medium, and large). Figure 5–10 shows the CBRN FM12 from Avon Protection Systems.



Figure 5–10. CBRN FM12, Avon Protection Systems

5.1.4.3.2 3M™ FR-M40

The 3M™ Full Facepiece Respirator FR–M40 received NIOSH CBRN certification on March 15, 2004. Its approval number is TC–14G–0271CBRN. The 3M™ Full Facepiece Respirator FR–M40 is designed to provide respiratory protection against certain airborne contaminants when used in accordance with use and limitation instructions and applicable safety and health regulations. When the 3M™ Full Facepiece FR-M40 is used with the 3M™ Eyepiece Outserts, the 3M™ Second Skin, and the 3M™ Canister FR–15–CBRN, it is NIOSH approved for use in CBRN environments. A hood can be ordered separately but is not required for CBRN certification. The facepiece has a dual ocular lens for enhanced personnel performance and security, as well as two integral speaking diaphragms for clearer communications. The canister can be mounted on either side of the facepiece. The canister has a shelf life of 5 yr. The drinking tube connection is for use in noncontaminated areas. The facepiece is available in three sizes (small, medium, and large). Figure 5–11 shows the 3M™ FR-M40 facepiece, from 3M.



Figure 5–11. 3M™ FR-M40 Facepiece, 3M

5.1.4.2.3 Scott CBRN/M110 Air Purifying Respirator

The Scott CBRN/M110 received NIOSH CBRN certification in 2006. Its approval number is TC–14G–0283CBRN when used with Scott’s CBRN Cap-1 Canister; it is NIOSH 42 CFR 84 approved when used with Scott’s Enforcement Cartridge, MPC Plus Cartridge or P100 Cartridge. The two-piece constructed hypoallergenic, halobutyl rubber mask has a silicone nose cup to

provide comfort as well as permeation resistance to a wide variety of toxins. The low profile design and dual lens gives an increased field of vision, and an optional drinking bottle allows for easy fluid intake. The 6-point textile head harness allows for quick and easy donning. The canister has a shelf life of 7 yr. The facepiece is available in two sizes (small and large). The M100 NIOSH 42 CFR Part 84 certification also includes multiple PAPR approvals. Figure 5–12 shows the CBRN/M100 Air Purifying Respirator, from Scott Health & Safety.



Figure 5–12. CBRN/M110 Air Purifying Respirator, Scott Health & Safety

5.2 Powered Air-Purifying Respirators

A PAPR is a respirator system that uses a blower to pass ambient air through air-purifying canisters to deliver filtered air into a hood, helmet or facepiece. A PAPR system includes a motor blower unit with filter cartridges, a headpiece, a battery, and a breathing tube. There are two types of PAPRs: tight-fitting and loose-fitting. A CBRN tight-fitting PAPR covers the eyes, nose and mouth, seals to the face or neck, and consists of a facepiece, helmet, hood, or a combination of these. The tight-fitting PAPR requires fit-testing. The requirements focus on anticipated needs of the emergency responder (e.g., fire service, law enforcement) community. The CBRN loose-fitting PAPR includes a shroud that provides dermal protection to the head and upper torso but does not form an airtight seal to the face or neck. The loose-fitting PAPR does not require fit-testing. These types of PAPRs are more suited for emergency medical technicians. PAPRs come in several different configurations (e.g., belt mount, face mount, vehicle mount, or headgear mount), but the configuration addressed in this report consists of the air-purifying element(s) attached to a small, battery powered blower worn on the belt and connected to the respiratory inlet covering by a flexible tube. The battery is either mounted separately on the belt or as part of the blower. These systems are compatible with many different styles of headgear ranging from lightweight hoods, hard hats, helmets, and half or full facepiece respirators.

A PAPR is a positive air system that uses battery power to pump ambient air through a filter into a facepiece in contrast to an APR, which is a negative air supply system. Since the airflow is much higher than needed to breathe, the excess flow creates a positive pressure in the face mask, preventing contamination from inward leaking. By reducing the burden caused by normal breathing (lung power) to pull air through the filter element, PAPRs allow the wearer to breathe easier relative to negative-pressure APRs. It is important to note that PAPRs cannot be worn with encapsulating garments but can be worn with NFPA 1994, Class 3 ensembles utilizing

separate hoods if the configuration provides adequate ventilation at the intake of the unit, and if the unit is adequately protected from contamination. Also note that PAPRs cannot be worn under IDLH conditions.

PAPRs capable of providing the wearer with respiratory protection from CBRN threats were identified and evaluated in this guide. Standards and requirements associated with PAPRs are discussed in section 5.2.1. Section 5.2.2 provides the findings of the market survey. Section 5.2.3 lists selection factors that were identified for evaluating PAPRs, and section 5.2.4 details the evaluation results for the PAPRs.

5.2.1 Standards and Requirements

The NIOSH, under the authorization of the Federal Mine Safety and Health Act of 1977 and the Occupational Safety and Health Act of 1970, provides a testing approval and certification program assuring commercial availability of safe personal protective devices to include respiratory protection devices. NIOSH develops improved performance regulations, tests and certifies (or approves) devices, and purchases approved and certified products on the open market to verify quality of the respirator.

Requirements for industrial respirator certification are included under the following regulation:

Code of Federal Regulations
Title 42–Public Health
Part 84–Approval of Respiratory Protection Devices
Subpart KK–Gas Masks

NIOSH has developed a CBRN PAPR standard draft concept paper, *Chemical, Biological, Radiological, and Nuclear (CBRN) Powered, Air-Purifying Respirator (PAPR) Concept*, that defines performance based requirements that meet the widely varying needs of hazard protection, varying work rates, and comfort. The latest draft released by NIOSH for discussion is dated November 4, 2005.

The CBRN PAPR approval process is conducted in two stages. The CBRN PAPR must meet the following minimum requirements:

- (a) Approval under NIOSH 42 CFR, Part 84.
 - 42 CFR, Part 84, Subparts A, B, D, E, F, and G.
 - 42 CFR, Part 84, Subpart I, Paragraphs 84.110–123.
 - 42 CFR, Part 84, Subpart KK, Paragraphs 84.1100–84.1155 (in whole or in part).
- (b) Special tests under NIOSH 42 CFR Part 84.63(c).
 - 42 CFR, Part 84, Subpart H, Part 84.63(c), paragraphs 1.0 through 4.3.10.

Once approvals have been issued for 42 CFR Part 84 approval and subsequent CBRN PAPR approval, manufacturers may apply for approval of CBRN PAPR retrofit kits to upgrade existing 42 CFR Part 84 PAPR to CBRN PAPR standards.

As of March 2006, the CBRN PAPR standard has not been finalized, therefore there are no CBRN certified PAPRs.

5.2.2 Market Survey Results

An extensive market survey was conducted to identify commercially available PAPRs. This market survey encompassed the solicitation of manufacturers, the review of previously conducted market assessments, literature searches, and consultation with SMEs. In order to provide detailed information on each PAPR item, 55 data fields were identified. These data fields were developed by SMEs and approved for distribution by the government. Definitions for the PAPR data fields are provided in appendix L.

The market survey resulted in the identification of eight PAPR systems that use tight-fitting masks and six PAPR systems that use loose-fitting hoods. The data sheets, along with an index alphabetically identifying each of the PAPRs by manufacturer, item name, and page number for the data sheets, are included in appendix M.

Table 5–3 details the number of PAPRs identified for each of 10 vendors that were included in the market survey.

Table 5–3. PAPRs identified for each vendor

Vendor	Tight-Fitting	Loose-Fitting	PAPRs
3M	1*	1*	2
Bullard	1*		1
First Line Technology, LLC		1*	1
Global Secure Safety	1*	1*	2
ILC Dover		1	1
Mine Safety Appliances Company	1*	1*	2
Safety Equipment America (The SEA Group)	1		1
SafetyTech International, Inc.	1*		1
Scott Health and Safety	1*		1
TVI Corporation	1	1*	2
Total	8	6	14

* Certified to NIOSH 42 CFR Part 84 standards.

5.2.3 Selection Factors for PAPRs

An initial set of selection factors for PAPRs emerged from the review of the *Guide for the Selection of Personal Protective Equipment for Emergency First Responders* (NIJ Guide 102–00) as well as the draft *Report on the Market Survey and Assessment of Alternative and Supplemental Personal Protective Equipment*. These factors were then shared with experienced scientists and engineers who have multiple years of experience in PPE, domestic preparedness, and identification of emergency first responder needs. The factors were also shared with the emergency first responder community in order to get their thoughts and comments. The selection factors were modified to eliminate some of the initial criteria, include new criteria, and expand several definitions.

These factors were developed to allow for a quick comparison of commercially available PAPRs. *It is important to note that the evaluation conducted using the selection factors was based solely upon vendor-supplied data and no independent evaluation of equipment was conducted in the development of this guide.* The vendor-supplied data can be found in its entirety in appendix L.

The results of the evaluation of the PAPRs are provided in section 5.2.4. The remainder of this section defines each of the selection factors. Details on the manner in which the selection factor was used to assess the PAPRs are included within the section factor definition.

5.2.3.1 NIOSH Approval

This criterion indicates the NIOSH approval number associated with the PAPR. The approval numbers may take one of the following forms: TC-21C-XXXX or TC-23C-XXXX.

The acronym “TC” stands to Testing/Certification. The “21C” is a schedule category that corresponds to a NIOSH approved dust/mist filtering respirator. The “23C” is a schedule category that corresponds to PAPR systems. The last four numbers represents the actual approval number that NIOSH has assigned to the respirator. Although the NIOSH CBRN standards have not been finalized, many of the PAPRs have met the initial minimum requirements of approval under NIOSH 42 CFR Part 84.

5.2.3.2 Facepiece

This selection factor indicates the type of headgear that is used with the PAPR system, either a facepiece respirator (mask) or a lightweight hood. The PAPRs are grouped in table 5-4 according to the type of facepiece that is used.

5.2.3.3 Market Price

The market price selection factor details the cost associated with a functioning PAPR to include any required support equipment and consumables. The price indicated is the commercial price associated with the PAPR at the time that this guide was published. This price is not a special Government price.

5.2.3.4 Field of View

This selection factor refers to a respirator’s field of view as a percentage of the unmasked field of view. The selection factor also includes the peripheral and up/down field of view. According to the draft concept standard for CBRN PAPR (May 30, 2005), an expected field of view is at least 90 %.

5.2.3.5 Total Weight

The weight of the PAPR system is based on the weight, fit, and comfort associated with a donned and functioning PAPR. This selection factor considers the total weight of the working equipment/system, which includes the weight of the cartridge/canister. The total weight should be considerably less than that of an SCBA system.

5.2.3.6 Sizes Available

This selection factor refers to the variety of sizes available to the first responder community. Tight-fitting masks should have enough sizes to adequately fit most of the members of the response team, both male and female. One-size-fits-all is preferable for the hood type, loose-fitting PAPRs.

5.2.3.7 Hydration Capability

This selection factor indicates if the PAPR comes with a hydration capability, has a hydration capability option, or does not offer a hydration capability. Although hydration capability is considered an enhanced capability, factors that affect hydration include location of the mission, type of mission, and length of mission,

Hydration Capability	
●	Hydration capability
○	No hydration capability
⊗	Not specified

5.2.3.8 Battery Life/Type

This selection factor reflects the type of battery available with the PAPR. It is assumed that user preference is for disposable or rechargeable batteries; readily available from any retail store rather than manufacturer-specific batteries; and long lasting, before they have to be recharged and/or disposed.

Battery Type	
●	≥8 h disposable and rechargeable (COTs)
◐	≥8 h disposable and rechargeable (manufacturer-specific)
◑	≥8 h disposable or rechargeable (COTs or manufacturer-specific)
◒	≥4 h disposable and rechargeable (COTs and manufacturer-specific)
○	≥4 h disposable or rechargeable (COTs and manufacturer-specific)
⊗	Not specified

5.2.3.9 Indicators and Alarms

The CBRN concept paper specifies the PAPR must be equipped with a low battery indicator that alerts the user when 15 min but not more than 45 min of operational battery life remains, as well as a low-flow indicator that alerts the user when airflow in the breathing zone reaches the minimum flow to maintain positive pressure. The indicator can be active or passive including vibratory, audible, and/or visible. This selection factor also considers the type of alarm (i.e., single or combination).

Indicator and Alarms	
●	Combination of visible, audible, and/or vibrator, and low-flow indicator
◐	Combination of visible, audible, and/or vibrator with no low-flow indicator; or single alarm with low-flow indicator
◑	Single alarm (visible, audible, or vibratory), no low-flow indicator
○	No alarm capability
⊗	Not specified

5.2.3.10 Airflow Resistance

Airflow resistance for breath responsive PAPRs will be evaluated under the requirements of 42 CFR 84, subpart J, Sec. 84.157, for pressure-demand supplied air respirators.

- The pressure in the facepiece shall not fall below atmospheric at inhalation airflows less than 115 L (4 ft³)/min for tight-fitting facemasks and 170 L (6 ft³)/min for loose-fitting.
- The exhalation resistance to a flow of air at a rate of 85 L (3 ft³)/min shall not exceed the static pressure in the facepiece by more than 51 mm. (2 in) of water-column height.

Airflow Resistance	
●	≥350 L/min
◐	≥250 L/min to 349 L/min
◑	≥150 L/min to 249 L/min
◒	≥115 L/min to 149 L/min
○	≤115 L/min
⊗	Not specified

5.2.3.11 Inhalation Resistance

Inhalation resistance is the ease at which a PAPR wearer can breathe air. Requirements of 42 CFR 84, subpart J, Sec. 84.157 state that the static pressure in the facepiece shall not exceed 38 mm (1.5 in) of water-column height.

Inhalation Resistance	
●	≤38 mm H ₂ O
○	>38 mm H ₂ O
⊗	Not specified

5.2.3.12 Exhalation Resistance

Exhalation resistance is the ease at which an APR wearer can exhale air. The NIOSH APR CBRN standard requires an exhalation resistance of less than 20 mm H₂O at 85 L/min. The military specification for the M40 requires an exhalation resistance less than 26 mm H₂O.

Exhalation Resistance	
●	≤15 mm H ₂ O
◐	≤20 mm H ₂ O
◑	≥20 mm H ₂ O
⊗	Not specified

5.2.3.13 Breathing Performance

Breathing performance includes both work rates and breath responsiveness of the PAPR. PAPRs designated for the moderate breathing rate will be tested at a minute volume of 40 L/min. PAPRs designated for the high breathing rate will be operated at a minute volume of 103 L/min. The desired breathing performance is dependent on the mission type and expected work rate.

Breathing Performance	
●	Demand responsive, high and/or moderate breathing rate
◐	Constant flow, high and/or moderate breathing rate
◑	Moderate (conventional) breathing rate
⊗	Not specified

5.2.3.14 Blower Assembly Mount Location

The blower assembly mount is the location where the PAPR is worn, i.e., back, left, and/or right. Blower assembly mounting options indicate the number of potential locations for mounting the blower to the user and could include a vest, belt, or other attachment. Blowers that can be mounted in multiple configurations would allow the user flexibility to tailor to mission or protective ensemble.

Blower Assembly Location	
●	Multiple locations and 2 or more mounting options
◐	Single location and 2 mounting options
◑	Single or multiple locations and single mounting option
⊗	Not specified

5.2.3.15 Blower Noise

This selection factor refers to the noise that is generated by the blower. If the noise of the blower is too loud, the user may miss commands or may suffer noise stress. The standard noise level is ≤ 80 decibel (dBA).

Blower Noise	
●	≤ 70 dBA
◐	≤ 75 dBA
◑	≥ 80 dBA
⊗	Not specified

5.2.3.16 Facepiece/Hood Blower Hose Mount

The facepiece/hood blower hose mount is the location that the delivery hose from the blower interfaces with the mask. Locations could include the left or right cheek, center, or rear mount. Consideration should be given to the mounting location to ensure that it does not interfere with other equipment.

Facepiece/Blower Hose Interface	
●	Center, right, left, or rear interchangeable
◐	Right and left cheek (interchangeable)
◑	Right cheek, left cheek, or rear (factory set)
◒	Center mounted
⊗	Not specified

5.2.3.17 Canister/Filter Options

This selection factor addresses the number of canister/filters the mask is capable of using.

Canister/Filter Options	
●	Multiple—3 filters
◐	Multiple—2 filters
◑	Single filter
⊗	Not specified

5.2.3.18 Package Volume

The selection factor refers to the external dimensions of the PAPR system when packaged for storage and transportability.

Package Volume (With Accessories)	
●	$\leq 1.0 \text{ ft}^3$
◐	$\leq 2.0 \text{ ft}^3$
◑	$\leq 3.0 \text{ ft}^3$
⊗	Not specified

5.2.4 Evaluation of PAPRs

Eleven of the PAPR systems are currently certified by NIOSH under 42CFR Part 84 for industrial use, and the other three PAPRs are in various stages of NIOSH approval under 42CFR Part 84 for industrial use. All of the PAPRs are waiting for the NIOSH CBRN standard to be finalized. PAPR systems are available with a tight-fitting mask style facepiece or with a loose-fitting hood configuration. Table 5–4 shows the evaluation results for the eight tight-fitting style PAPRs and the six loose-fitting PAPRs identified at the time this guide was written.

Table 5-4. PAPR evaluation results

ID Number	Brand and Model	NIOSH Approvals	Market Price	Field of View (%)	Weight (kg)	Sizes Available	Hydration	Battery Life	Indicator/Alarms	Airflow Resistance	Inhalation Resistance	Exhalation Resistance	Breathing Performance	Blower Mount	Blower Noise	Blower Hose/Mask Location	Filter Options	Package Volume
TIGHT-FITTING PAPRS																		
1	3M™ RRPAPR System 6000 Series	TC-23C-2072	\$1.25K	?	1.66	SM L	○	●	○	●	○	●	○	●	○	●	○	●
2	Bullard PA40 Spectrum for First Responder PA40SPEC4 First Receiver PA40SPECDB	TC-21C-0774 & TC-23C-2236	\$1.2K	95	3.55	SM L	○	●	○	●	○	●	○	●	○	●	○	●
3	Global Secure Safety FR2 First Responder PAPR	TC-23C-2091	\$495	95	3.08	SM L	○	●	○	●	○	●	○	●	○	●	○	●
4	MSA OptimAir 6A PAPR (Advantage 3100)	TC-23C-2209	?	90	2.72	SM L	●	○	○	⊗	○	●	○	●	⊗	●	○	●
5	The SEA Group SE 400 and SE 46 VSE 400, SE 46	Submitted 42CFR Part 84	\$ 2.6K	78	3.78	SM	●	○	●	●	○	●	○	●	○	●	○	●
6	SafetyTech International C420 PAPR N-60122-001	TC-23C-2188	\$1.23K *	85	2.49	SM/L	●	○	○	○	⊗	⊗	○	○	⊗	⊗	○	○
7	Scott Health & Safety Proflow 3 805820	42 CFR Part 84	?	87	?	SLX L	⊗	⊗	○	⊗	⊗	⊗	●	⊗	⊗	⊗	⊗	⊗
14	TVI Corporation PureAir PAPR K7 PAPR System	TC-21C-0789	?	87	0.5	SM L	⊗	○	○	○	⊗	○	○	○	○	○	○	○
LOOSE-FITTING PAPR																		
8	First Line Technology, LLC. TST/SWEDE Butyl PAPR TST-BUTYLPAPRKIT	Submitted 42CFR Part 84	\$775	?	1.59	One	●	○	○	○	⊗	⊗	○	○	○	○	○	○
9	3M™ Breathe Easy™ 10 Butyl Rubber Hood PAPR System FR57L10, FR57N10	TC-23C-2071	\$1.25K	?	1.66	One	○	●	●	●	○	●	○	●	○	●	○	●
10	ILC Dover, Inc. First Receiver™ Sentinel XL™	Submitted 42CFR Part 84	\$800	?	1.99	One	⊗	○	⊗	⊗	○	○	○	○	○	○	○	○
11	MSA OptimAir® 6HC PAPR	TC-23C-2201 & TC-23C-2209	\$782		2.73	One	●	○	○	⊗	⊗	○	○	○	○	○	○	○
12	TVI Corporation PureAir PAPR C8 PAPR System	TC-21C-0778	\$850	85	0.91 *	One	●	○	○	○	○	○	○	○	○	○	○	○
13	Global Secure Safety FR3 First Responder PAPR	TC-21C-2092	\$600	95	3.18	One	●	○	○	○	○	○	○	○	○	○	○	○

*Without battery

Fourteen PAPR systems were identified and evaluated for this guide. Although several of the PAPRs are certified by NIOSH under 42CFR Part 84 industrial standard, as of January 2007 the NIOSH CBRN standard has not been finalized and, thus, no PAPR has been NIOSH CBRN certified.

The PAPRs have been subdivided into tight-fitting full facepiece mask type PAPRs and loose-fitting hood type PAPRs. Eight PAPRs are designed to be used with a tight-fitting full facepiece. One PAPR is designed to be used with a tight-fitting half facepiece and an accompanying hood. Five PAPRs are designed to be used with only a loose-fitting hood. Descriptions of each of the 12 PAPRs are provided in the remainder of this section. The descriptions are based on vendor-supplied data, which can be found in appendix L.

5.2.4.1 3M Rapid Response Powered Air Supply (RRPAS™) 6000 Series

The 3M RRPAS™ 6000 Series is certified by NIOSH under 42CFR Part 84 (TC-23C-2072). The NIOSH approved system includes a NIOSH approved negative pressure 3M™ 6000 full facepiece series respirator; a breathing tube assembly; 3M™ FR40 cartridge; 3M™ Breathe Easy™ Turbo PAPR unit; NiMH battery pack; 3M™ RRPAS™ bag/vest; and an airflow indicator. The 3M RRPAS™ 6000 products are designed for rapid response and mobility. The RRPAS™ PAPR is a bag that stores all of the components of the RRPAS system when it is not in use and reverses into a vest to support the 3M™ Breathe Easy™ Turbo PAPR Blower Unit on the wearer's back. The vest will accommodate up to 50 in chest/waist sizes. The gross weight of the complete system is 10.6 lb and measures 22.8 in x 13.8 in x 12 in. The airflow range is 4 cfm to 15 cfm (114 lpm to 425 lpm) depending on the headpiece. The mask is available in three sizes (small, medium, and large) and does not have hydration capability. Figure 5-13 shows the Rapid Response Powered Air Supply (RRPAS™) 6000 Series from 3M.



Figure 5-13. Rapid Response Powered Air Supply (RRPAS™) 6000 Series, 3M

5.2.4.2 Bullard PA40 Series Full Facepiece PAPR

The Bullard PA40 Series Full Facepiece PAPR (First Responder: PA40SPEC4) is currently certified by NIOSH under 42CFR Part 84 with two HEPA filters (TC-21C-0774). The Bullard PA40 Series Full Facepiece PAPR (First Responder: PA4SPECDB) is currently certified by NIOSH under 42CFR Part 84 with NBC filters (TC-23C-2236). The Bullard PA40 PAPR is a tight-fitting full facepiece assembly with a vinyl decon belt, two NiMH battery packs for 8 h to

10 h running capacity, a breathing tube, and a large speaking diaphragm. The facepiece assembly is the Spectrum full facepiece mask that is also NIOSH certified for use with an APR and SCBA. The PAPR blower is designed to operate at a minimum air flow of 5.0 ft³ (140 L) of air per min. Both the blower and battery have an audible alarm. The facepiece is available in two sizes (small or medium-large), requires fit-testing, and does not have hydration capability. Figure 5–14 shows the PA40 Series Full Facepiece PAPR from Bullard.



Figure 5–14. PA40 Series Full Facepiece PAPR, Bullard

5.2.4.3 Global Secure Safety FR2 First Responder PAPR

The Global Secure Safety FR2 First Responder PAPR is NIOSH approved protection for P100 HEPA particulates, radon daughters, radio nuclides, organic vapors, chlorine, hydrogen chloride, sulfur dioxide, formaldehyde, ammonia, and methylamine (TC–23C–2091). It also uses the special NP5505 filtering din-thread canisters, which have been independently tested against war gases. The complete unit has a Neoprene full face mask, air supply tube, integrated blower, alkaline (optional lithium) battery pack, waist belt, and two (2) “Super NBC” Filter Canisters that can be mounted to the blower. The tight fitting facemask is available in 3 sizes and requires a fit test. It can be donned in less than 30 s. The system is sealed for long-term storage; i.e., the canister has a 12 yr shelf life if kept in the original package. Although the unit is available with lithium batteries or rechargeable NiCads, the standard unit is shipped with alkaline D cells providing 8 h of continuous use. Replacements are available at local stores. Figure 5–15 shows the Homeland Security Hood (FR3–84) from Global Secure Safety.



Figure 5–15. FR2 First Responder PAPR, Global Secure Safety

5.2.4.4 MSA OptimAir® 6A PAPR

The MSA OptimAir 6A PAPR, complete with Millennium® Facepiece, is a NIOSH approved system (TC-23C-2209) specifically designed for domestic preparedness during terrorist situations. The complete OptimAir 6A PAPR includes CBA/RCA OptiFilter® Cartridges, a breathing tube, a single-use lithium battery, a NiCad battery for training use, a single-unit single-rate battery charger for NiCad battery, a belt-mounted motor/blower module, a polyurethane-coated nylon belt, and a flow check meter. The canisters contain a pleated high-efficiency (P100) filter to remove aerosols, radionuclides, and solid particulates; and an impregnated activated carbon bed to adsorb (filter out) gases and vapors. The carbon bed is the same as used in military canisters and is effective against mustard (HD), sarin (GB), DMMP (a sarin simulant), HCN, and CK. The entire PAPR weighs less than 6 lb. The battery has a 10 yr shelf life.

The Millennium® has a flexible, one-piece polyurethane lens with a wide field of vision that is bonded to the durable Hycar rubber facepiece. The facepiece lens has a scratch-resistant coating and has been engineered to be optically correct, giving superior visibility and peripheral vision. The facepiece features a fully elastic, 6-point head harness for easy on/off and adjustment. For efficient training and savings on batteries, a rechargeable NiCad battery can be substituted for the lithium battery. Figure 5-16 shows the OptimAir® 6A PAPR with full facepiece mask from Mine Safety Appliances Company.



Figure 5-16. Optimair 6A PAPR, Mine Safety Appliances Company

5.2.4.5 Safety Equipment of America (SEA) SE 400 and SE 46

Safety Equipment of America (SEA) expects to submit the SE 400 and SE 46 PAPRs for CBRN approval when the standard is finalized. The SE 46 has been submitted for NIOSH approval (for industrial 42 CFR, Part 84, Subpart I, Paragraphs 84.110-123). The SE400AT-2 has a single visor full facemask and two particle filters, providing air at a rate of more than 400 L/min peak inhalation airflow to maintain positive pressure. The SE 46 is a breath-responsive PAPR with an approximate airflow of 460 L (peak airflow). Both the SE 400 and SE 46 are equipped with an audible and a visible warning for low airflow. The units will warn if any of the parts are outside of their calibrated settings or if anything unusual is happening with the unit. In addition, both units can be calibrated to warn for clogged filters, based on volume of air through the filter or how long the filter has been used.

The SE 46 has a data logging function logging up to 500 events, which can be downloaded or can make a registration of the last 500 events. It is designed to give a protection factor of approximately 3000 in power off mode (test conducted on U.S. army personnel) and can be equipped with a pressurization hose providing positive pressure in a Level A or Level B suit. The prefilter can be changed without removing the main filter. The SE400AT-2, from Safety Equipment of America (SEA), is shown in figure 5-17.



Figure 5-17. SEA SE400-AT-2, Safety Equipment of America (SEA)

5.2.4.6 SafetyTech C420 PAPR

SafetyTech International's C420 PAPR system is currently certified by NIOSH under 42CFR Part 84 (TC-23C-2188) HE/OV/AM/CL/HC/MA with the Promask 2000 full facepiece gas mask and an M95 cartridge. The blower is an airtight system that can be decontaminated of NBC agents and other TICs. The battery compartment is also airtight, waterproof, and can be decontaminated. The C420 PAPR system provides a constant, filtered airflow of between 115 lpm and 140 lpm to the user's facepiece. The motor is shielded to not interfere with radio communication. The batteries may be "hot-swapped" during use in a warm zone environment. The C420 has a 10 yr service life and the battery has a 10 h performance. The Promask 2000 has dual filter connections that facilitate left-handed or right-handed operations. The facepiece can be donned in <8 s, and is available in regular and small sizes.

The C420 is available as a NIOSH approved National Guard Kit with a two-battery option; a NIOSH approved National Guard Kit, rechargeable only; a NIOSH approved Responder Kit; and a NIOSH approved Tactical Kit with the M95 mask. The NIOSH approved National Guard Kit with a two-battery option includes the C420 1-speed blower, Promask 2000 full facepiece gas mask, breathing tube, decontamination belt, airflow indicator, BA5800/U 10 h mission battery, 1-position battery charger with two NiMH rechargeable batteries, Cap 2-M95 combination filter cartridges, and molded carrying case. The C420 PAPR, from SafetyTech International, Inc., is shown in figure 5-18.



Figure 5-18. C420 PAPR, SafetyTech International, Inc.

5.2.4.7 Scott's Proflow 3

Scott's Proflow 3 from Scott Health & Safety meets 42 CFR Part 84 requirements for CA penetration and permeation. It is approved with the Scott SCBA CBRN facepieces—AV 2000 and AV 3000; and also approved with the M95 and butyl hood. The Proflow 3 is equipped with microprocessor controlled airflow management to adjust the flow rate to ensure an adequate, easy-to-breathe air supply regardless of filter loading. The Proflow 3 is belt mounted and designed to ride in the small of the wearer's back for the ultimate in comfort and support. The compact design makes donning and doffing easy. The NiMH batteries can be recharged without removing. A full recharge takes only 6 h, and the power supply up to 8 h depending on the filter/facepiece combination. Two LEDs on the charger indicate the charging status. The breathing tube is temperature, abrasion and chemical resistant, and can be removed for cleaning and decontamination. Visual and audible warnings warn if the battery is low or if the optimum airflow rate (6 cfm) is not achieved. The Proflow 3 incorporates a data-logging function, which automatically records information about the use and performance of the blower unit. Service Tool software is available to authorized service centers for tracking the history of each individual unit.

The Proflow 3 is used with Promask 40 AV-3000™ and AV-2000® facepieces. Both the AV-3000 and AV-2000 are fully interchangeable with Scott's full line of SCBA, air-supplied respirators, and air-purifying respirators, as well as Scott's communications products. The Proflow 3, from Scott Health and Safety, is shown in figure 5-19..



Figure 5-19. Proflow 3, Scott Health & Safety

The six PAPR systems that are designed such that a hood offers the first line of facial protection are described in the remainder of this section.

5.2.4.8 First Line Technology TST/SWEDE Butyl PAPR

First Line Technology's TST/SWEDE Butyl PAPR is pending NIOSH 42 CFR Part 84 certification and has passed testing by ICS (an independent testing organization). The TST design is a combination butyl rubber hood and a silicone half mask attached to the blower system. The butyl rubber offers protection against all known chemical agents for extended durations of time. The butyl hood has a straw and clean water drinking system with quick connections for safe and easy hydration and optional integrated communications with voice amplifier and radio set. It is easily cleaned with a soap solution allowing for multiple uses and a service life up to 25 yr. The silicon half mask allows users with glasses, facial hair, and long hair. The blower system is a lightweight unit with two filters creating an overpressure of clean air in an attached hood.

The PAPR is worn on a belt with single-button operation. It has two 100 A2B1E2K1P3 canisters, and is powered by 6 (C) batteries for a constant airflow of 140 lpm. It provides protection of up to 6 h and has an audible low voltage and airflow warnings. Figure 5–20 shows the TST/SWEDE Butyl PAPR from First Line Technology, LLC.



Figure 5–20. TST/SWEDE Butyl PAPR, First Line Technology, LLC.

5.2.4.9 3M™ Breathe Easy™ (BE) 10 Butyl Rubber Hood PAPR System

3M™ Breathe Easy™ Butyl Rubber Hood PAPR is certified by NIOSH under 42CFR Part 84 (TC–23C–2071). The 3M™ Breathe Easy™ Turbo is a belt-mounted blower/filtration unit intended to provide respiratory protection against certain particulates, organic vapors, acid gases, and other inorganic gases. The components of the PAPR include a turbo blower/filtration unit, approved respirator headpiece assembly, breathing tube assembly, battery pack (NiMH, NiCd, or Lithium), battery charger, airflow indicator, and appropriate filter/cartridge/canister. The butyl rubber hood can be worn with facial hair and glasses. The Turbo unit is secured to the wearer via a belt assembly, available in three materials nylon, polyurethane-coated nylon, and leather and will accommodate up to 60 in waist sizes. The Breathe Easy™ Turbo is not designed for high-temperature environments and should not be exposed directly to radiant heat sources, sparks, or flame. The airflow range is from 4 cfm to 15 cfm (114 lpm to 425 lpm), depending on

the headpiece. Figure 5–21 shows the 3M™ Breathe Easy™ (BE) 10 Butyl Rubber Hood PAPR System from 3M.



Figure 5–21. 3M™ Breathe Easy™ (BE) 10 Butyl Rubber Hood PAPR System, 3M

5.2.4.10 ILC Dover Sentinel XL™

ILC Dover’s Sentinel XL™ is a loose-fitting hood type PAPR designed with the intent of certifying it to the yet unpublished NIOSH standard for CBRN PAPRs. The Sentinel XL™ was submitted for NIOSH approval (for industrial 42 CFR, Part 84, Subpart I, Paragraphs 84.110–123). The unit comes complete with hood, blower, three canisters, breathing tube, battery pack, and belt. The blower has an integral battery pack and can be integrated with a backpack for easy transport. It has a low voltage alarm, is easy to decontaminate, and has a flow rate of 170 lpm. The batteries can be rechargeable or disposable and provide 8 h of operation, with an end-of-life indicator. Filtration includes a particulate (P100) filter and industrial gasses filter. The loose-fitting Sentinel XL™ is available in butyl or Tyvek. It requires no training, fits all sizes, has a wide field of view, can be worn by those with facial hair, and stores flat. The Sentinel XL™ from ILC Dover is pictured in figure 5–22.



Figure 5–22. Sentinel XL™, ILC Dover, Inc.

5.2.4.11 MSA OptimAir® 6HC PAPR

The MSA OptimAir 6HC PAPR (Health Care Powered Air-Purifying Respirator) with Tychem SL Hood is a NIOSH approved system (TC–23C–2201)); and with the Advantage 3100 facemask, it is also NIOSH approved (TC–23C–2209). The MSA OptimAir 6HC PAPR is

specifically designed to protect health care professionals when they are performing first responder duties during homeland security or terrorist situations.

The OptimAir 6HC PAPR with Tychem SL Hood includes HC CBA/RC cartridges (package of 6), breathing tube for hood, single-use lithium battery, NiCd battery for training use, single-unit single-rate battery charger for NiCd battery, belt-mounted motor/blower module, polyurethane-coated nylon belt, flow check meter, and adapter for flow check meter for use with hood. The canisters contain a pleated high-efficiency (P100) filter to remove aerosols, radionuclides, and solid particulates; and an impregnated activated carbon bed to adsorb (filter out) gases and vapors. The carbon bed is the same as used in military canisters and is effective against mustard (HD), sarin (GB), DMMP (a sarin simulant), HCN, and CK. The entire PAPR weighs less than 6 lb. The battery has a 10 yr shelf life. The hood weighs approximately 8 oz and has a fully adjustable suspension and soft fabric collar. Front and rear bibs provide neck-opening protection without restricting arm movement. A wraparound lens helps provide wide visibility. The positive-pressure hood is easy to don and requires no fit-testing. The hood is compatible with eyeglasses, long hair, and facial hair. The OptimAir® 6HC (Health Care) PAPR from Mine Safety Appliances Company is pictured in figure 5–23.



Figure 5–23. OptimAir® 6HC (Health Care) PAPR, Mine Safety Appliances Company

5.2.4.12 TVI Corporation PureAir C8 PAPR System

The PureAir C8 PAPR System, from TVI Corporation, is a loose-fitting PAPR that is NIOSH-approved under 42CFR Part 84 (TC–21C–0778). The hood is available in butyl or Tyvek®. The butyl hood meets military standard MIL–C–51215A. The PureAir C8 PAPR System is designed to conform to the proposed CBRN standards for powered respirators. The PureAir C8 PAPR System is designed for first responders to provide respiratory protection against CBRN, certain particulates, organic vapors acid gases, and other inorganic gases. It is lightweight and easy to don and doff. The breathing tube is chemical resistant and flame retardant. The belt-mounted motorized air system delivers 8 CFM breathing air, is low noise (57 dBA at ear), has a high-pitched audible alarm, and has an airflow indicator. The canisters include HEPA, OVAG/HEPA, C2A1, and CBRN. Batteries are NiMh and last 4 h to 6 h or with an optional 6 h to 12 h battery pack. Ten year packaging is available. Figure 5–24 shows the PureAir C8 PAPR System from TVI Corporation.



Figure 5–24. PureAir C8 PAPR System, TVI Corporation

5.2.4.13 Global Secure Safety FR3 and FR3–84 First Responder PAPRs

The Global Secure Safety Homeland Security Hood (FR3 or (FR3–84) is NIOSH approved protection for P100 HEPA particulates, radon daughters, radio nuclides, organic vapors, chlorine, hydrogen chloride, sulfur dioxide, formaldehyde, ammonia, and methylamine (TC–21C–2092). Both the FR3 (with a Tychem SL Saranex hood and cape) and the FR3–84 (with a butyl rubber hood) units have a breathing tube, integrated blower, alkaline (optional lithium) battery pack, waist belt, and three NBC filter canisters. Hoods are loose fitting, do not require a fit test, and can be donned in less than 30 s, and are one size fits most. The full facemask is available in 3 sizes. The PAPRs use the special NP5505 filtering din-thread canisters, which have been independently tested against war gases and NIOSH approved for a range of industrial gases and HEPA particulate protection. The systems are sealed for long-term storage; i.e., the canister has a 12-yr shelf life if kept in the original package. Although the unit is available with lithium batteries or rechargeable NiCads, the standard unit is shipped with alkaline D cells providing 8 h of continuous use. Replacements are available at local stores. Figure 5–25 shows the Homeland Security Hood (FR3–84) from Global Secure Safety.



Figure 5–25. FR3–84 First Responder PAPR, Global Secure Safety

5.2.4.14 TVI Corporation PureAir K7 PAPR System

The PureAir K7 PAPR System, from TVI Corporation, is a tight-fitting PAPR that is NIOSH-approved under 42CFR Part 84 (TC–21C–0789) with two high efficiency (HE) filters. The PureAir K7 PAPR System is designed to conform to the proposed CBRN standards for powered

respirators. The system is designed for protection in a hospital/first receiver environment, where biological protection is desired. The PureAir K7 PAPR is lightweight [complete system weighs 529 g (1 lb 1 oz)] and is easy to don and doff. The breathing tube is chemical resistant and flame retardant. The belt-mounted motorized air system delivers 6 CFM breathing air, is low noise (57 dBA at ear), has a high-pitched audible alarm, and has an airflow indicator. Batteries are NiMh and last 4 h to 6 h or with an optional 6 h to 12 h battery pack. Ten year packaging is available. Figure 5–26 shows the PureAir K7 PAPR System from TVI Corporation.



Figure 5–26. PureAir K7 PAPR System, TVI Corporation

5.3 Self-Contained Atmosphere-Supplying Respirators

Atmosphere-supplying respirators provide clean breathing air from an uncontaminated source, independent of the surrounding atmosphere, rather than filtering contaminants from the atmosphere. Atmosphere-supplying respirators include open-circuit self-contained breathing apparatus (SCBA), supplied air respirators (SAR), and closed-circuit SCBA systems (rebreather). The open-circuit SCBA provides breathing air from a cylinder of compressed air that is held in a frame worn on the back. An SAR provides breathing air from a stationary source of compressed breathing air to which the user is tethered. A rebreather reuses exhaled air after it has passed over a scrubber to remove carbon dioxide and replenished with oxygen from a compressed oxygen cylinder. SAR and rebreathers are not discussed in this report.

In the hierarchy of respiratory protection, an open-circuit SCBA provides the highest level of protection available. A SCBA is the required form of respiratory protection if the contaminated environment is IDLH or has not been characterized. The SCBA can also be used in oxygen-deficient environments since the wearer receives air from the enclosed cylinder.

Two items to consider when selecting SCBA equipment include the length of time of the required task and the ease of use of the equipment. The weight/comfort of the equipment is dictated by the length of time the equipment will be used and the frequency of the application. Time limits are based on the size of the air supply tank (cylinder), and the size of the air supply tank is based on the need for a 15 min, 30 min, 45 min, or 60 min system as well as responder's level of exertion. The shorter the duration of the task, the less breathing air is required, so consequently, a smaller lighter air supply tank is possible. When carrying a SCBA for an extended period of time, a few pounds difference can make a dramatic difference in the comfort level. In addition, the smaller air supply tanks are generally less expensive.

SCBAs can be made lighter by packing a larger volume of air into a smaller cylinder. Three pressure option configurations are available: high-pressure that can be pressurized to 4500 psi, medium-pressure that can be pressurized to 3000 psi, and low-pressure that can be pressurized to 2216 psi. The 4500 psi and the 2216 psi are the two most common SCBA options. In order to provide the necessary 60 min or 45 min breathing air in a tank that can be worn with relative comfort, the 60 min or 45 min SCBA must use high-pressure cylinders. The 30 min SCBA are available with either high-pressure or low-pressure cylinders. Although the cylinder of the 30 min high-pressure SCBA is lighter and smaller than the cylinder of the 30 min low-pressure SCBA, it is more expensive than the low-pressure SCBA.

There are three primary uses for SCBAs: industrial, fire-fighting, and chemical-incident response. Industrial SCBAs must meet basic NIOSH standards; firefighting SCBAs must be compliant with NFPA 1981 standards as well as applicable NIOSH standards; and chemical incident response SCBAs used by emergency first responders, the newest subcategory of SCBA, must meet NIOSH CBRN approval for responding to terrorist events involving CBRN agents.²¹ The CBRN SCBA provides a specified level of respiratory protection when used during entry into CBRN atmospheres of unknown or IDLH concentration. NFPA performance levels for CBRN SCBA include NFPA 1994 Class 1, NFPA 1994 Class 2, and NFPA 1994 Class 3, and NFPA 1991 (2005 Edition).²²

Many acronyms are used when discussing SCBA, SCBA components, and SCBA accessories. Table 5–5 defines the terms that are most commonly used.

Table 5–5. Commonly used terms

Acronym	Definition	Description
EOST	End-Of-Service-Time	Redundant indicators.
HUD	Heads-up Display	Provides information regarding breathing air supply status. Alerts that notify users when the breathing air supply is 50 % full. Where the HUD is powered by a battery power source, a low battery alert signals when the charge is reduced to the level where the HUD can operate for 2 h more.
RIC/ UAC	Rapid Intervention Crew/Universal Airline Coupling	Provides a standard connection for a rescue breathing air supply to be connected to a victim responder’s SCBA to replenish the breathing air in the SCBA breathing air cylinder when the victim cannot be rapidly moved to a safe atmosphere.
LDV	Lung demand valve	Pressure demand regulator.
PASS	Personal Alert Safety System	Provides enhanced tracking, identification, and monitoring of firefighters’ exposure levels and physical status during the course of their firefighting activities.
RIT	Rapid Intervention Team	Available personnel for the rescue of emergency members operating inside an IDLH atmosphere. The development, response, make-up, and deployment of the rapid intervention team is left up to the discretion of the authority having jurisdiction.
VPU	Voice Projection Unit	Facepiece mounted, attached to, and completely supported by the SCBA facepiece.
VAS	Voice Amplification System	Wireless and digital voice technology.

²¹ For more detailed information on the CBRN requirements, visit Centers for Disease Control and Prevention’s (CDC) NIOSH Web site at <http://www.cdc.gov/niosh/npptl/scbasite.html>

²² <http://www.cdc.gov/niosh/npptl/standardsdev/cbrn/scba/>

SCBAs capable of providing the wearer with respiratory protection from CBRN threats were identified and evaluated in this guide. Although retrofit kits to achieve CBRN protection are available for certain SCBAs that are currently certified to NFPA 1981 (1997 Edition), they are not included in this study. Standards and requirements associated with SCBAs are discussed in section 5.3.1. Section 5.3.2 provides the findings of the market survey. Section 5.3.3 lists selection factors that were developed for evaluating SCBAs, and section 5.3.4 details the evaluation results for SCBAs.

5.3.1 Standards and Requirements

NIOSH, under the authorization of the Federal Mine Safety and Health Act of 1977 and the Occupational Safety and Health Act of 1970, provides a testing approval and certification program assuring commercial availability of safe personal protective devices to include respiratory protection devices. NIOSH develops improved performance regulations, tests and certifies (or approves) devices, and purchases approved and certified products on the open market to verify quality of the respirator.

NIOSH is currently testing and certifying SCBA for use by emergency responders in atmospheres that contain CBRN respiratory hazards. Requirements for industrial respirator certification are included under the following regulation:

Code of Federal Regulations
Title 42–Public Health
Part 84–Approval of Respiratory Protection Devices
Subpart H–Self Contained Breathing Apparatus
Compliance of an SCBA to the National Fire Protection Association (NFPA) 1981²³
Approval of the SCBA to 42 CFR Part 84.63(c) special tests

The CBRN–based standard associated with CBRN SCBA is covered by the *Statement of Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Self Contained Breathing Respirators (SCBA)*, September 2003. For CBRN certification, two special tests under 42 CFR Part 84.63(c) are required: (1) chemical agent permeation and penetration resistance testing against distilled mustard and sarin, and (2) laboratory respirator protection level (LRPL). In addition, the SCBA must be NFPA 1981 (2002 edition) compliant. The NIOSH CBRN standards can be found at: <http://www.cdc.gov/niosh/npptl/scbasite.html>.

In January 2002, NIOSH began accepting approval applications from SCBA manufacturers who have developed SCBAs to meet the new NIOSH guidelines. On May 31, 2002, NIOSH issued its first approval of respirators for occupational use by emergency responders against CBRN agents.²⁴ Sec. 84.71, self-contained breathing apparatus required components, was revised on October 1, 2004.²⁵ The focus of these standards is on the special CBRN requirements.

²³ <http://www.cdc.gov/niosh/npptl/resources/pressrel/pdfs/scba-attach-a.pdf>

²⁴ <http://www.cdc.gov/niosh/interspup.html>

²⁵ http://a257.g.akamaitech.net/7/257/2422/12feb20041500/edocket.access.gpo.gov/cfr_2004/octqtr/42cfr84.71.htm

Based on these standards, NIOSH has been able to test and certify SCBAs for use by emergency first responders in atmospheres that contain CBRN respiratory hazards.

5.3.2 Market Survey Results

An extensive market survey was conducted to identify commercially available SCBAs. This market survey encompassed the solicitation of manufacturers, the review of previously conducted market assessments, literature searches, a review of the NIOSH Certified Equipment List (CEL), and consultation with SMEs. In order to provide detailed information on each SCBA item, 41 data fields were identified. These data fields were developed by SMEs and then reviewed and approved by the government. Definitions for the SCBA data fields are provided in appendix N.

The market survey resulted in the identification of 35 SCBA systems, 32 of which are NIOSH CBRN certified, and three that are planned for NIOSH CBRN certification. The SCBA data sheets, along with an index identifying each of the SCBA, are included in appendix O. The number of SCBA identified for each of the eight vendors included in the market survey is presented in table 5–6.

Table 5–6. SCBAs identified for each vendor

Vendor	NIOSH CBRN Status		Total
	Certified	Planned for Submission	
Dräger Safety, Inc.	4		4
Global Secure Safety Corp.		1	1
International Safety Instruments	4	1	5
Interspiro	6		6
Mine Safety Appliances Company	5		5
Scott Health and Safety	9		9
Survivair	4		4
Supercritical Thermal Systems, Inc.		1	1
Total	32	3	35

5.3.3 Selection Factors for SCBAs

An initial set of selection factors for SCBA emerged from the review of the *Guide for the Selection of Personal Protective Equipment for Emergency First Responders* (NIJ Guide 102–00) as well as the draft *Report on the Market Survey and Assessment of Alternative and Supplemental Personal Protective Equipment*. These factors were then shared with experienced SMEs who have multiple years of experience in PPE, domestic preparedness, and identification of emergency first responder needs. The factors were also shared with the emergency first responder community in order to get their thoughts and comments.

These factors were developed to allow for a quick comparison of commercially available SCBAs. *It is important to note that the evaluation conducted using the selection factors was based solely upon vendor-supplied data and no independent evaluation of equipment was*

conducted in the development of this guide. The vendor-supplied data can be found in its entirety in appendix N.

The SCBA comparisons are provided in section 5.3.4. The remainder of this section defines each of the selection factors. Details on the manner in which the selection factor was used to assess the SCBAs are included within the section factor definition.

5.3.3.1 NIOSH Approval

This criterion indicates the NIOSH approval number associated with the SCBA. The approval numbers takes the following form: TC-13F-XXXX.

The acronym “TC” stands for Testing/Certification. The “13F” is a schedule category that corresponds to SCBA systems. The XXXX number represents the actual approval number that NIOSH has assigned to the respirator. The approval number for SCBA approved for CBRN environments always includes a CBRN suffix (TC-13F-XXXXCBRN). It is important to keep in mind that each approved NIOSH CBRN SCBA configuration (based on psig and breathing duration) has a unique NIOSH CBRN number.

5.3.3.2 Market Price

The market price selection factor details the cost associated with a functioning SCBA, to include any required support equipment and consumables. The price indicated is the commercial price associated with the SCBA at the time that this guide was published. This price is not a special Government price.

5.3.3.3 Weight

The weight of the SCBA system is based on the weight, fit, and comfort associated with a donned and functioning SCBA. This selection factor considers the weight of the basic unit with the mask and air cylinder.

5.3.3.4 Sizes Available

This selection factor refers to the variety of mask sizes available to the first responder community. Tight-fitting masks should have enough sizes to adequately fit most of the members of the response team, both male and female.

5.3.3.5 Field of View

This selection factor refers to the facemask’s field of view as a percentage of the unmasked field of view. The selection factor may also include the peripheral and up/down field of view. An expected field of view is at least 70 % (NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0314).

5.3.3.6 Pressure Rating and Cylinder Duration

Pressure ratings are either high pressure (4500 psig), mid pressure (3000 psig), or low pressure (2216 psig). Cylinder durations are 15 min, 30 min, 45 min, or 60 min, and are dictated by the pressure (i.e., low pressure will only have 30 min duration). Therefore, this selection factor focuses primarily on the number of pressures available for each SCBA combination.

SCBA Pressure	
●	3 pressures (high, mid, low)
◐	2 pressures (high/low, high/mid, mid/low)
◑	1 pressure (high, mid, or low)
⊗	Not specified

5.3.3.7 Battery Life/Type

This selection factor reflects the type of battery available with the SCBA. It is assumed that user has no preference for disposable or rechargeable batteries but prefers readily available batteries from any retail store rather than manufacturer specific batteries; and batteries that are long lasting.

Battery Type	
●	≥8 h disposable and rechargeable (COTS)
◐	≥8 h disposable and rechargeable (manufacturer specific)
◑	≥8 h disposable or rechargeable (COTS or manufacturer specific)
◒	≥4 h disposable and rechargeable (COTS and manufacturer specific)
○	≥4 h disposable or rechargeable (COTS and manufacturer specific)
⊗	Not specified

5.3.3.8 Indicators and Alarms

NFPA 1981 standard, 2002 edition requires the HUD have a visible LED indicator. This selection factor considers the type of alarm (i.e., single or combination) available with the SCBA. Depending on the application, alarms may need to be visual and vibratory rather than audible. For instance, in law enforcement applications where stealth component is more important, a vibratory alarm would be desired.

Indicator and Alarms	
●	Combination (visible, audible, and/or vibrator)—low flow indicator and battery life
◐	Combination (visible, audible, and/or vibrator)—low flow indicator
◑	Single alarm (visible, audible, or vibratory)—low flow indicator and battery life
◒	Combination (visible, audible, and/or vibrator) or single alarm—battery life
○	No alarm capability
⊗	Not specified

5.3.3.9 Facepiece Compatibility

This criterion indicates if the SCBAR facepiece can be used with other types of respirators such as an APR or PAPR.

Facepiece Compatibility	
●	NIOSH certified for use with SCBA, same mask can be used for multiple platforms
◐	NIOSH certified for use with SCBA, separate masks, even though identical, are required for use with SCBA and APR
◑	Facemask can only be used with SCBA
⊗	Not specified

5.3.3.10 Harness Design

This selection factor refers to the design of the harness of the SCBA. The design of the harness and backpack affects the comfort and utility of the SCBA. The SCBA should have enough adjustability to fit most members of the response team, both male and female. This selection indicates whether the harness is adjustable.

Backpack and Harness Design	
●	Manually adjustable
◐	Automatically adjustable
◑	Swivel belt
◒	Not adjustable
⊗	Not specified

5.2.3.11 Heads-Up-Display (HUD)

The selection factor refers to the location of the HUD and whether it is wireless (uses batteries) or is hardwired to the mask.

HUD	
●	Inside mask/wireless
◐	Inside mask/wired
◑	Outside mask/wireless or wired
◒	Wireless or wired (location not specified)
⊗	Not specified

5.3.4 Evaluation of SCBAs

As of March 2006, 35 SCBA systems were identified and evaluated for this guide (table 5–7). Thirty-two SCBA combinations have been NIOSH CBRN approved to NFPA 1981 (2002 Edition) standard, and three SCBA combinations are approved to non-CBRN standards. It should be noted that there are several NIOSH CBRN numbers within each vendor brand and model. Each NIOSH CBRN number represents a different SCBA configuration (combination of psig and breathing duration) that is NIOSH CBRN approved.

Table 5–7. SCBA evaluation results

ID Number	Brand and Model	NIOSH CBRN	Market Price	Weight (kg)	Sizes Available	Field of View	Pressure Ratings	Battery Life/Type	Indicators/Alarms	Facepiece Compatibility	Backpack and Harness Design	HUD
1	Dräger AirBoss™ Evolution Plus and AirBoss™ PSS100 Plus	TC-13F-515CBRN TC-13F-514CBRN TC-13F-513CBRN TC-13F-512CBRN	\$4K to \$6K	10.9	One	92 %	●	●	●	●	●	●
2	Global Secure Pioneer Pro 2002	NFPA 1981 (2002 Ed) and NFPA 1982 (1998 Ed)*					⊗	●	●	⊗	⊗	◐
3	ISI Viking DX/DXL	TC-13F-521CBRN TC-13F-522CBRN TC-13F-523CBRN TC-13F-520CBRN	\$5K to \$5.6K	11.2, 12.6, 14.6	SML	95 %	●	●	◐	◐	●	●
4	ISI Viking ST	42 CFR 84 certified for police service	\$1K	10.95	SML	95 %	●	●	◐	◐	●	●
5	Interspiro Spiromatic S4	TC-13F-133CBRN TC-13F-213CBRN TC-13F-197CBRN		7.2	SML/ XL		◐	●	◐	◐	⊗	◐
6	Interspiro Spirotek T4	TC-13F-375CBRN TC-13F-420CBRN TC-13F-421CBRN		7.2	SML/ XL		◐	●	◐	◐	⊗	◐
7	MSA Custom 4500® MMR Xtreme® Air Mask	TC-13F-526CBRN TC-13F-474CBRN TC-13F-475CBRN TC-13F-476CBRN	\$5K	9.5	SML	92 %	●	●	◐	●	◐	◐
8	MSA Ultralite® XTreme® MMR Air Mask	TC-13F-473CBRN	\$5K	9.5	SML	92 %	●	●	◐	●	◐	◐
9	Scott Scott Air-Pak® 2.2/3.0/4.5	TC-13F-80CBRN TC-13F-366CBRN TC-13F-76CBRN TC-13F-212CBRN TC-13F-96CBRN					●	●	⊗	⊗	⊗	⊗
10	Scott NxG ₂ ™ Air-Pak	TC-13F-516CBRN TC-13F-517CBRN TC-13F-518CBRN TC-13F-519CBRN					◐	●	⊗	⊗	⊗	⊗
11	Survivair Panther CBRN SCBA	TC-13F-285CBRN TC-13F-284CBRN TC-13F-286CBRN TC-13F-287CBRN		13.6, 12.7, 15.4	SML		◐	●	◐	⊗	⊗	◐
12	Supercritical (SCAMP)	Planned for NIOSH CBRN submission	\$7K	1.99 [†]	SL	85 %	⊗	◐	●	◐	⊗	◐

* Integrated PASS Portion of the Integrated PASS/SCBA is certified to NFPA 1981 (2002 Edition) and NFPA 1982 (1998 Edition).

[†] Without air cylinder.

Descriptions of the SCBA configurations included in this guide are provided in the remainder of this section. The descriptions are based on vendor-supplied data, which can be found in appendix N. The SCBAs are grouped by vendor.

5.3.4.1 Dräger AirBoss® Plus Series

Dräger offers four SCBA configurations that are NIOSH CBRN approved. Three configurations are high-pressure (4500 psig) and one is low-pressure (2216 psig). The AirBoss™ Plus Series includes the Dräger AirBoss® Evolution Plus and the AirBoss® PSS100 Plus.

The high-pressure (4500 psig) models include the following configurations:

- TC-13F-515CBRN (4500 psig, 60 min) AirBoss® Evolution Plus SCBA and AirBoss™ PSS® 100 Plus SCBA.
- TC-13F-514CBRN (4500 psig, 45 min) AirBoss® Evolution Plus SCBA and AirBoss® PSS® 100 Plus SCBA.
- TC-13F-513CBRN (4500 psig, 30 min) AirBoss® Evolution Plus SCBA and AirBoss™ PSS® 100 Plus.

The low-pressure (2216 psig) model includes the following configuration:

- TC-13F-512CBRN (2216 psig, 30 min) AirBoss® Evolution Plus SCBA and AirBoss™ PSS® 100 Plus SCBA.

Both the AirBoss® Evolution Plus SCBA and the AirBoss™ PSS® 100 Plus SCBA use the Panorama Nova P Black EPDM Facepiece and LDV Assembly. The Panorama Nova facepiece is a one-size-fits-all design with a full line of accessories, including spectacle kits, quick donning headstraps, and communications devices. See section 5.1.4.2.2 for a complete description of the Panorama facepiece.

The AirBoss® Plus performance features include the Prism® Pressure Information System [a wireless Heads-Up-Display (HUD)]; the AirBoss® Sentinel II (a fully integrated “Life Support Monitoring Device” for fire fighting SCBAs); a harness suspension system; a first stage pressure reducer; a plus lung demand valve; the Panorama Nova Facemask; a rapid intervention crew/universal airline coupling (RIC/UAC); and a Super I-PASS II. AirBoss® Plus accessories include an advanced communication system; a multi-link auxiliary airline system, the AirBoss® RIT LifeGuard (for rescue operations); a hairnet head harness; a carrying case; and a RAPID Adaptor (to convert the Panorama Nova Mask from positive pressure to an APR). The SCBA cylinders are constructed of aluminum, fiberglass hoop wrapped, fiberglass full-wrap, or light-weight carbon fiber full-wrap. The cylinder valves are anodized aluminum with a built-in bumper protector. The valve gauge is double sided with a luminescent gauge face for easy readability.

The AirBoss PSS100® Plus SCBA has a fully adjustable 3-position backplate and harness suspension system, designed to fit with any torso size and length, with the weight of the SCBA riding on the hips, to reduce back strain and increase stability and balance by providing a lower center of gravity. The harness suspension system is made from a blend of Kevlar/Aramid/Ublend material for abrasion resistance and strength. The large low-profile friction buckles allows for donning and doffing while wearing gloves.

The AirBoss Evolution® Plus SCBA high-performance breathing apparatus was designed for use in professional fire fighting applications. The lightweight carbon one-piece composite backplate conforms to the shape of the back. The pneumatic design of the harness suspension system moves weight from the shoulders and applies it to the hips, enabling the user to carry more weight. The AirBoss® Evolution Plus can be customized by adding accessories.

The backplate dimensions for both the AirBoss PSS100® Plus SCBA and the AirBoss Evolution® Plus SCBA are approximately 584 mm (28.5 in) x 279 mm (11 in) x 6 mm (0.25 in). The basic unit weighs 4.1 kg (9.1 lb). Figure 5–27 shows AirBoss® PSS100 Plus and AirBoss® Evolution Plus from Dräger Safety, Inc.



Figure 5–27. AirBoss® PSS100 Plus and AirBoss® Evolution Plus, Dräger Safety, Inc.

5.3.4.2 Global Secure Safety Pioneer Pro 2002

The Global Secure Safety Pioneer Pro 2002 SCBA for fire and emergency services is designed to meet the NFPA 1981 (2002 Edition) requirements—configurations 3100003 and 3100004. The Integrated PASS Portion of the Integrated PASS/SCBA (designed to be readily removed from the SCBA to be used alone) is certified to NFPA 1981 (2002 Edition) and NFPA 1982 (1998 Edition): [SCBA Portion: Pioneer Pro PASS Portion: Pro PASS II (5100018–01)] and [SCBA Portion: Pioneer Pro PASS Portion: Pro PASS II (5100018–02) with heat sensor].

The PioneerPro 2002 SCBA low-profile facepiece is lightweight and has a high impact-resistant, anti-fog coated lens designed to minimize CO₂ build-up. The scratch-resistant facepiece offers good peripheral vision. The patented air delivery systems and the back-mounted second stage positive pressure regulator provide airflow to the facepiece while eliminating the need for a mask-mounted regulator.

The PioneerPro 2002 SCBA is a fully automatic SCBA that has no buttons, knobs, flaps, hose couplings, etc. It features the CairnsAIR's patented AlertAIR computer and Heads Up Display (HUD) that alarms at ½ and ¼ air and alerts for low battery; a fully integrated Personal Alert Safety System (PASS) that eliminates false alarms; a carbon cylinder to reduce weight and profile. The Pioneer Pro also offers a Rapid Intervention Crew (RIC) fitting that allows connection to universal Rapid Intervention Team (RIT) emergency air kit; a Voice Projection Unit (VPU) option; and a full body motion frame. Figure 5–28 shows the Pioneer Pro 2002 from Global Secure Safety.



Figure 5–28. Pioneer Pro 2002, Global Secure Safety

5.3.4.3 International Safety Instruments (ISI) Viking Series

ISI has several Viking SCBA configurations. Four of ISI Viking DX/DXL SCBA configurations are currently NIOSH CBRN certified. ISI's Viking SL is certified under 42 CFR 84 for police service. There are three high-pressure NIOSH CBRN certified Viking DX/DXL SCBA configurations and one NIOSH CBRN certified low-pressure Viking DX/DXL SCBA configuration.

The high-pressure (4500 psig) Viking DX/DXL models include the following configurations:

- TC–13F–523CBRN (4500 psig, 60 min) Viking DX/DXL.
- TC–13F–522CBRN (4500 psig, 45 min) Viking DX/DXL.
- TC–13F–521CBRN (4500 psig, 30 min) Viking DX/DXL.

The low-pressure (2216 psig) Viking DX/DXL model includes the following configurations:

- TC–13F–520CBRN (2216 psig, 30 min) Viking DX/DXL.

5.3.4.3.1 International Safety Viking DX/DXL

Two Viking SCBA models are certified for CBRN use, the Viking DXL and the Viking DX. Both models use the AirSwitch facemask and regulator. The AirSwitch facemask integrates the regulator and facemask into one unit, which allows the user to switch back and forth quickly from cylinder to ambient air without docking. A five-light HUD is built into the nosepiece inside the facemask to give a continuous readout of cylinder pressure, end-of-service alarm, radio status, battery status, and PASS pre-alarm. The facemask has a butyl facemask skirt, an easy donning harness, a nose cup, a diaphragm seal, and o-rings. ISI has created an additional label for the facemask that allows users to know at a glance that the facemask is CBRN agent approved. The AirSwitch Regulator is available in three face seal sizes.

The Viking DXL SCBA is designed for fire fighters. A key element of the DXL design is the control console that displays a digital readout of the cylinder pressure and houses the voice amplification (VAS) system, a radio interface that allows for integration with existing radios, and

the PASS that automatically activates upon pressurizing the pneumatics. The PASS is incorporated into the Viking DXL, the voice amplification comes standard at no additional charge, and the radio interface is an option on the unit.

The Viking DX model is designed for simplicity. It includes a HUD, a RIC fitting, an AirSwitch facemask and pneumatics, but has few options. Add-ons include a PASS (belt mounted and removable), voice amplification, and an air pressure gauge.

Options for both the Viking DXL and Viking DX include either 2216 psi or 4500 psi; a buddy breather system; 30 min, 45 min, and 60 min cylinder durations; aluminum, hoop-wrapped, or fully wrapped cylinders; and an airline attachment. Figure 5–29 shows the Viking DX/DXL from International Safety Instruments.



Figure 5–29. Viking DX/DXL, International Safety Instruments

5.3.4.3.2 International Safety Viking ST

ISI's Viking ST SCBA is designed for the law enforcement community. It is all black and has a "Stealth" mode to turn off the lights and voice amplifier until needed. The unit incorporates the AirSwitch facemask and regulator, easy donning harness, HUD for low air, and built-in communications. Voice Amplification comes standard at no additional charge. A universal cylinder band makes changing cylinders quick and easy without tools. The black Kevlar cylinder bag covers the cylinder for high-risk operations. The backframe places the cylinder weight on the hips, rather than on the back. The pressure reducer, hoses, and other solid-state components are all protected inside the compartmentalized composite backframe. Options include a radio interface and earpiece speakers, a black Nomex hood, a buddy breather, an airline attachment, cylinders 2216 psig and 4500 psig, and 30 min, 45 min, and 60 min durations. Figure 5–30 shows the Viking ST from International Safety Instruments.



Figure 5–30. Viking ST, International Safety Instruments

5.3.4.4 Interspiro SCBA

Interspiro has three Spiromatic S4 SCBA configurations that are NIOSH certified, NFPA 1981 (2002 Edition) compliant, and NIOSH CBRN approved (high-pressure version); and three Spirotek T4 SCBA configurations that are NIOSH certified, NFPA 1981 (2002 Edition) compliant, and NIOSH CBRN approved (high-pressure version).

The facemask used by Interspiro SCBAs is the S4 /T4 Face Mask. There are two “S” Face mask configurations, the S4 /T4 Face Mask with pull tabs and HUD and the S4/T4 Face Mask with frame pull and HUD. Both mask configurations are CBRN approved. The S4/T4 Face Mask with mask pull tabs and HUD includes a breathing valve, a by-pass, and HUD, and is available in four sizes. The head harness is attached to the rubber tabs of the wide angle face mask making it compatible with hoods and protective garments. An integrated ambient air hatch, with a built-in safety valve, provides fresh air without removing the breathing valve. The HUD is on the left side of the mask and operates independently of the second stage breathing valve. The S4/T4 Face Mask with frame pull and HUD is the original S-mask with the head harness attached to the visor frame.

5.3.4.4.1 Interspiro Spiromatic S4

The high-pressure (4500 psig) Interspiro Spiromatic S4 models include the following configurations:

- TC–13F–197CBRN (4500 psig, 60 min) Spiromatic S4 9030.
- TC–13F–213CBRN (4500 psig, 45 min) Spiromatic S4 6630.
- TC–13F–133CBRN (4500 psig, 30 min) Spiromatic S4 4530.

The Spiromatic S4 is the fourth generation SCBA of NIOSH/NFPA approved Spiromatic-S. The Spiromatic S4 facemask is equipped with a HUD, RIC, PASS, and either a pivoting waist-belt or a sidearm waist-belt. The HUD is on the left side of the mask to indicate the remaining cylinder pressure with a low air alarm, as well as a breathing valve with a by-pass. Other features include a pivoting harness backplate, a buddy breathing hose, dual redundant EOST indicator, and integrated PASS.

The Breathing Apparatus Computer (BAC) is a black box mounted on the SCBA back frame to monitor the cylinder pressure and other data. The information is sent to the HUD Rapid Intervention Connection (RIC) or the Universal Air Connection (UAC), which allows for rapid refilling of cylinders during emergency conditions. The integrated ambient air hatch provides fresh air without removing the breathing valve. The padded harness has wide shoulder straps and wrap around Velcro to secure hoses and allow the regulator to be removed. All Spiromatic S4 configurations are available with or without a waist pad. Figure 5–31 shows the Spiromatic S4 from Interspiro.



Figure 5–31. Spiromatic S4, Interspiro

5.3.4.4.2 Interspiro Spirotek T4

The high-pressure (4500 psig) Interspiro Spirotek T4 models include the following configurations:

- TC 13F-421CBRN (4500 psig, 60 min) Spirotek T4 9030.
- TC-13F-420CBRN (4500 psig, 45 min) Spirotek T4 6630.
- TC-13F-375CBRN (4500 psig, 30 min) Spirotek T4 4530.

The Spirotek T4 offers “All-hazards” protection (fire, hazmat, WMD, and chem/bio terror threats). The Spirotek T4 is equipped with a supplied air coupling on the right shoulder strap in order to make connection and disconnection of air line hoses and accessories. The sidearm waist belt harness with wide shoulder straps features wrap around Velcro to secure hoses and allow the regulator to be removed. The HUD, on the left side of the mask, indicates remaining cylinder pressure with a low air alarm. The BAC is mounted on the SCBA backframe and monitors cylinder pressure and other data and then sends that information to the HUD. The RIC (or UAC) allows for rapid refilling of cylinders during emergency conditions. Other features include an integrated PASS, an integrated ambient air hatch to provide fresh air without removing the breathing valve, and a pivoting waist belt. Figure 5–32 shows the Spirotek T4 from Interspiro.



Figure 5–32. Spirotek T4, Interspiro

5.3.4.5 MSA Mask Mounted Regulator (MMR) Air Mask

MSA offers five SCBA configurations that are NIOSH certified, NFPA 1981 (2002 Edition) compliant, and NIOSH CBRN approved. Three configurations are high-pressure (4500 psig); one is mid-pressure 3000 psig, and one is low-pressure (2216 psig).

The high-pressure (4500 psig) models include the following configurations:

- TC-13F-474CBRN (4500 psig, 60 min) Custom 4500[®] MMR Xtreme CBRN Air Mask with FireHawk Regulator.
- TC-13F-475CBRN (4500 psig, 30 min) Custom 4500[®] MMR Xtreme CBRN Air Mask with FireHawk Regulator.
- TC-13F-476CBRN (4500 psig, 45 min) Custom 4500[®] MMR Xtreme CBRN Air Mask with FireHawk Regulator.

The mid-pressure (3000 psig) model includes the following configurations:

- TC-13F-526CBRN (3000 psig, 30 min) Custom 4500[®] MMR Xtreme CBRN Air Mask with FireHawk Regulator.

The low-pressure (2216 psig) model includes the following configurations:

- TC-13F-473CBRN (2216 psig, 30 min) Ultralite[®] MMR Xtreme CBRN Air Mask with FireHawk Regulator.

Two facepiece assemblies, the Ultravue Facepiece and the Ultra Elite Facepiece, are available from MSA that can be used with the Ultralite MMR Air Mask and the Custom 4500 MMR Air Mask. The facepiece assemblies are available in three sizes and two materials, black Hycar rubber and black silicone. Three sizes of optional nose cups are available, as well as a Speed-ON[®] Kevlar Facepiece harness or a traditional rubber harness with an adjustable 5-point suspension system are available. MMR Xtreme Air Masks options available on the Ultralite and Custom 4500 MMR Air Masks have a wide vision Ultra Elite[®] facepiece and a low-profile mask mounted FireHawk[™] MMR Regulator with large shutoff button. Several cylinder options are available with either a Black Rhino or Vulcan carrier/harness assembly. The FireHawk[™] MMR Regulator is entirely sealed from any initial contact with contaminants.

5.3.4.5.1 MSA Custom 4500® MMR Xtreme® Air Mask

The Custom 4500® Xtreme® MMR Air Mask is a pressure-demand SCBA that can be used with 30 min rated mid-pressure (3000 psig) or 30 min and 60 min rated high-pressure (4500 psig) cylinders. The mask-mounted regulator gives a compact, low-profile design. Key components of the Custom 4500® MMR Air Mask include an Ultra Elite or Ultravue facepiece; a 2nd stage mask-mounted regulator; a 1st stage cylinder-carrier mounted regulator; a low-pressure warning bell; a cylinder; and a steel-reinforced flame- and heat-resistant harness. MSA’s optional Quick-Fill System for fast refilling of cylinders while the unit is worn provides an emergency rescue capability that allows an SCBA user with a full cylinder to “transfill” air to a user with a low or an empty cylinder. Figure 5–33 shows the Custom 4500® MMR Xtreme® Air Mask SCBA and FireHawk™ MMR Regulator from Mine Safety Appliances Company.



Figure 5–33. Custom 4500® MMR XTreme® Air Mask SCBA and FireHawk™ MMR Regulator, Mine Safety Appliances Company

5.3.4.5.2 MSA Ultralite® XTreme® MMR Air Mask

The MSA Ultralite® MMR XTreme® Air Mask is a pressure-demand SCBA that features a 30 min rated low-pressure (2216 psig). The MSA Ultralite® has a Composite II Cylinder and a mask-mounted regulator that combines high-performance and a compact, low-profile design. Key components include an Ultra Elite or Ultravue facepiece; a 2nd stage mask-mounted regulator; a 1st stage cylinder-carrier mounted regulator; a low-pressure warning bell; a cylinder; and a steel-reinforced flame- and heat-resistant harness. An optional Quick-Fill System for fast refilling of cylinders while the unit is worn to provide an emergency rescue capability that allows an SCBA user with a full cylinder to “transfill” air to a user with a low or an empty cylinder. The entire unit weighs approximately 9.5 kg (21 lb). Figure 5–34 shows the Ultralite® MMR XTreme® Air Mask SCBA and FireHawk™ MMR Regulator from Mine Safety Appliances Company.



Figure 5–34. Ultralite[®] MMR Xtreme[®] Air Mask SCBA and FireHawk[™] MMR Regulator, Mine Safety Appliances Company

5.3.4.6 Scott CBRN SCBA

Scott has nine CBRN SCBA configurations that are NIOSH certified, NFPA 1981 (2002 Edition) compliant, and NIOSH CBRN approved. The nine CBRN SCBA configurations include five Air-Pak[®] Fifty[™] Series configurations and four Air-Pak NxG₂[™] SCBA configurations.

The Air-Pak[®] Fifty[™] 2.2 SCBA is used with the AV-2000[®] Facepiece or the AV-3000[™] Facepiece. The Air-Pak NxG₂[™] SCBA is used with the AV-3000 facepiece. Both the AV-3000 and AV-2000 are fully interchangeable with Scott's full line of SCBA, air-supplied respirators, and air-purifying respirators, as well as Scott's communications products.

The AV-2000 comes in four color-coded sizes: small (green), large (black), extra large (red), and Comfort Seal[™] (black) and is available with a rubber head harness, an industrial polyester head harness, or a Kevlar[®] head harness facepiece. The AV-3000 comes in three sizes of Comfort Seal[™] (small, medium, and large); it has four nose cup sizes (small, medium, large, and X-large). The AV-3000 has dual voicemitters, a 6-point quad adjustment head harness, a dual adjustment spectacle kit, and an Omni-mount bracket design allows for facepiece and transmitting communication equipment interface to be done on either voicemitter. The AV-3000 has a large sealing area for firefighter hood to facepiece interface. The AV-3000 has greater downward and peripheral vision than the AV-2000.

5.3.4.6.1 Scott Air-Pak[®] Fifty[™] Series SC/PD/CBRN SCBA

The high-pressure (4500 psig) models include the following configurations:

- TC-13F-212CBRN (4500 psig, 45 min) Air-Pak 4.5.
- TC-13F-96CBRN (4500 psig, 60 min) Air-Pak 4.5.
- TC-13F-76CBRN (4500 psig, 30 min) Air-Pak 4.5.

The mid-pressure (3000 psig) model includes the following configurations:

- TC-13F-366CBRN (3000 psig, 30 min) Air-Pak 3.0.

The low-pressure (2216 psig) model includes the following configurations:

- TC-13F-80CBRN (2216 psig, 30 min) Air-Pak 2.2.

Scott's Air-Pak™ Fifty offers respiratory protection for first responders, municipal and industrial firefighters. The Air-Pak® Fifty™ SCBA has top down convertibility with the AV-2000® facepiece, which allows for interface with Scott's full range of communication devices. It is available in 2216 psig, 3000 psig, and 4500 psig operating pressures, and cylinder durations of 30 min, 45 min, and 60 min. The Air-Pak Fifty has redundant safeguards for added safety and has a tactile feel end of service indicator. It has a lightweight, ergonomically designed harness system that places the bulk of the weight on the hips instead of the shoulders. The harness incorporates a quick release take-up with parachute-style hardware. Options include an EBSS, Quick Connect E-Z Flo® Regulator, Quick Charge, Airline pigtail, and integrated PASS. Related accessories include a Pak-Alert SE (an audible and visual alarm to notify rescuers and other firefighters), a hard carrying case, a soft carrying case, dual EBSS/airline connection, an extended duration airline, and Scott Electronic Management Systems (SEMS). Figure 5-35 shows the Air-Pak® Fifty™ Series SCBA from Scott Health and Safety.



Figure 5-35. Air-Pak® Fifty™ Series SCBA, Scott Health and Safety

5.3.4.6.2 Scott NxG2™ Air-Pak Series SC/PD/CBRN SCBA

The high-pressure (4500 psig) models include the following configurations:

- TC-13F-519CBRN (4500 psig, 60 min) Air-Pak NxG2™ Series.
- TC-13F-518CBRN (4500 psig, 45 min) Air-Pak NxG2™ Series.
- TC-13F-517CBRN (4500 psig, 30 min) Air-Pak NxG2™ Series.

The low-pressure (2216 psig) model includes the following configurations:

- TC-13F-516CBRN (2216 psig, 30 min) Air-Pak NxG2™ Series.

Scott's Air-Pak NxG2™ offers respiratory protection for first responders, and municipal and industrial firefighters. Scott's Air-Pak NxG2™ SCBA not only has all the features of the Air-

Pak Fifty, the Air-Pak NxG₂TM platform accommodates both AV-2000[®] and AV-3000 facepieces, as well as EZ-Flo I and II regulators. Many other standard components such as pressure reducer pistons and springs can also be used on the Air-Pak NxG₂TM. The targeted touch air-saver switch is angled for easy operation with a gloved hand and is designed to stop the free flow of air during donning and doffing. The EZ-Flo II features a quick-don mounting system, a positive locking mount that prevents accidental loosening of the regulator. The patent pending SNAP-CHANGE quick cylinder change-out eliminates the high-pressure hose and CGA coupling. The one-piece aluminum alloy backframe provides a light weight, compact, and durable housing system for the NxG₂TM electronics and pressure reducer. The frame is contoured to fit the wearer's back and places the bulk of the SCBA's weight on the hips. The Air-Pak NxG₂TM features hip-mounted reducer, buddy system indicator, separate pad and strap replacement parts, buddy-breathing system, one battery pack, SNAP-CHANGE cylinder, and a 3/10/15 yr warranty [electronics warranted for 3 yr, entire Air Pak (facepiece to cylinder) for 10 yr, pressure reducer for 15 yr]. Figure 5–36 shows the Air-Pak NxG₂TM Series SCBA from Scott Health and Safety.



Figure 5–36. NxG₂TM Air-Pak Series SCBA, Scott Health and Safety

5.3.4.7 Survivair Panther CBRN SCBA

Survivair offers four SCBA configurations that are NIOSH certified, NFPA 1981 (2002 Edition) compliant, and NIOSH CBRN approved. Three configurations are high-pressure (4500 psig) and one configuration is low-pressure (2216 psig).

The high-pressure (4500 psig) models include the following configurations:

- TC–13F–287CBRN (4500 psig, 60 min) Panther 2CBRN SCBA.
- TC–13F–286CBRN (4500 psig, 45 min) Panther 2CBRN SCBA.
- TC–13F–284CBRN (4500 psig, 30 min) Panther 2CBRN SCBA.

The low-pressure (2216 psig) model includes the following configuration:

- TC–13F–28CBRN (2216 psig, 30 min) Panther CBRN SCBA.

The Survivair Panther is used with the Twenty Twenty[®] PlusTM facepiece. The facepiece skirt is made of surgical grade silicone in a choice of skirt colors. The lens is made of hard-coated

polycarbonate, and the rims, nozzle cover, and Air Klic™ are made of tough plastic. Additional features include an exhalation valve in the facepiece, a Kapton® speaking diaphragm, multiple skirt and nose cup sizes (small, medium, and large), a choice of head harness (silicone headstrap or mesh style Kevlar® Headnet™), and a flash hood anchor point molded into the nozzle cover.

The MightyLight® backpack is made of fiberglass-filled nylon, and the harness material is made of a blend of Kevlar and Nomex®. Shoulder and hip pads spread the weight over more body surface for better weight distribution. A WedgeLock™ fastening system attaches the harness to the backplate without metal fasteners; parachute buckles are used on the shoulder straps for adjusting the backpack to an individual body. The first-stage pressure reducer is a piston and spring fail-safe design. The second-stage regulator, which attaches to and detaches from the facepiece quickly and easily, has a pilot valve and a first-breath-on mechanism. The HUD is hard wired and uses a single battery in the back-mounted transducer module. Accessories include voice amplification, radio communications, integrated PASS device, back-mounted remote alarm module for integrated PASS device, a buddy breather, auxiliary coupling for rapid intervention, supplied air attachment, to name a few. Figure 5–37 shows the Panther CBRN SCBA from Survivair.



Figure 5–37. Panther CBRN SCBA, Survivair

5.3.4.8 Supercritical Air Mobility Pack (SCAMP) SCBA

The Supercritical Air Mobility Pack (SCAMP) SCBA unit (750 psig, 30 min) has been tested at NIOSH under Part number 563001O2. SCAMP units are built and are planned for submission to NIOSH for NIOSH CBRN approval. Sixty min and 120 min units will also be made.

The SCAMP uses the CB40 CNR Air Purifying Full Face Respirator from New Pac Safety (ITL). The CB40 can be worn with a wide range of different helmets. It is available in three sizes and fits a variety of face sizes and shapes. The rubber mask has a panoramic, distortion lens with 85 % FOV. A deep chin cup provides stability and comfort. The head harness is 5-point adjustable with anti-rotational studs to prevent the straps from twisting when not in use. A speech diaphragm is factory fitted and an optional microphone can be fitted if required. The mask has a 10 yr shelf life, and it weighs 650 g (1.32 lb).

The Supercritical Air Mobility Pack® (SCAMP) SCBA uses cryogenic breathing gas technology originally developed for NASA's Apollo and Space Shuttle programs. The Supercritical Air

Mobility Pack® (SCAMP) provides at least 1 h of breathing air while cooling the wearer's body. Although the SCAMP is somewhat smaller and lighter than traditional SCBA, it has more capacity. The SCAMP uses supercritical fluid technology. A high-temperature fiberglass backpack contains the SCAMP dewar, a tank that holds the supercritical air (-320 °F) and replaces the standard SCBA high-pressure tanks. Low system pressure forces the super-cold air out of the dewar and through a series of heat exchangers, which warm the air to a comfortable breathing temperature while the other side of the heat exchangers cool the body through the use of a liquid-cooled garment. The heat exchangers have no moving parts and the system doesn't require user controls. A lighted display on the backpack's harness indicates how much air is left, and an alarm sounds when the tank is less than 25 % full. The vessel can be quickly filled. The SCAMP SCBA 1 h Dewar is approximately the size of a standard 30 min SCBA. Figure 5–38 shows the Supercritical Air Mobility Pack (SCAMP) SCBA, Supercritical Thermal Systems.



Figure 5–38. Supercritical Air Mobility Pack (SCAMP) SCBA, Supercritical Thermal Systems

5.4 Escape Respirators

The function of an escape respirator is to allow an individual working in a normally safe environment enough time to escape from an unexpected respiratory hazard. Escape respirators can be grouped into two categories: (1) air-purifying escape respirators (APER) and (2) self-contained escape respirators. The APER can be a simple, negative pressure design such as a half-face filter mask or a more sophisticated design with a filter canister mounted on the hood or mask to filter out harmful contaminants before the air is breathed. APERs can also be a positive-pressure design that incorporates a powered blower to force air through the filters to purify the air. The self-contained escape respirators have a hood that provides a barrier against contaminated outside air and an attached source of breathing air (i.e., a cylinder). Escape respirators are typically designed as one-time use for short periods ranging from 5 min to 60 min. Some escape respirators come in multiples sizes, but most are available in one size and typically seal at the neck. Selection should be based on the estimated time needed to escape and the possibility of IDLH or oxygen-deficient conditions.

Escape respirators capable of providing the wearer with respiratory protection from chemical, biological, and radiological/nuclear (CBRN) threats were identified and evaluated in this guide. Standards and requirements associated with escape respirators are discussed in section 5.4.1. Section 5.4.2 provides the findings of the market survey. Section 5.4.3 lists selection factors that

were identified for evaluating escape respirators, and section 5.4.4 details the evaluation results for escape respirators.

5.4.1 Standards and Requirements

NIOSH, under the authorization of the Federal Mine Safety and Health Act of 1977 and the Occupational Safety and Health Act of 1970, provides a testing approval and certification program assuring commercial availability of safe personal protective devices to include respiratory protection devices. NIOSH develops improved performance regulations, tests and certifies (or approves) devices, and purchases approved and certified products on the open market to verify quality of the respirator. Escape respirators can be certified by NIOSH as either a self-contained breathing apparatus or as a gas mask. Requirements for respirator certification for industrial use are included under the following regulation:

Code of Federal Regulations
Title 42–Public Health
Part 84–Approval of Respiratory Protection Devices
Subpart H–Self Contained Breathing Apparatus
Subpart I–Gas Masks

Once certified to the 42CFR Part 84 requirements, escape respirators are included on NIOSH's Certified Equipment List (CEL). Additional certification that covers CBRN respiratory protection can also be obtained. CBRN-based standards associated with CBRN escape respirators are covered by the following two NIOSH CBRN Standards:

- *Statement of Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Air-Purifying Escape Respirator.*
- *Statement of Standard for Chemical, Biological, Radiological and Nuclear (CBRN) Self-Contained Escape Respirator.*

These standards specify the minimum requirements for determining the effectiveness of APERs and self-contained escape respirators that address CBRN materials identified as inhalation hazards from possible terrorist events for use by the general working population.

Some of the areas addressed by these standards are based upon existing national and international standards. These include breathing resistance, field of view, fogging, human subject testing, and flammability/heat resistance.

The focus of these standards is on the special CBRN requirements. Specific requirements covered include duration of protection, canister test challenge and breakthrough concentrations, gas life, particulate/aerosol canister, service life, chemical agent permeation/penetration, donning, useful life, maintenance, training, markings, and labels. The NIOSH CBRN standards can be found at <http://www.cdc.gov/niosh/npptl/standardsdev/cbrn/default.html>.

Based on these standards, NIOSH has been able to test and certify escape respirators for use by emergency first responders in atmospheres that contain CBRN respiratory hazards. As of

February 2006 three APERs have been certified to CBRN APER standards. These respirators are included in the following list:

- ILC Dover SCape® CBRN30.
- MSA Safe Escape™ CBRN Respirator.
- North Escape Respirator (ER2000CBRN).

None of the self-contained escape respirators have yet to be CBRN certified. Details on the two CBRN certified APERs, as well as other escape respirators, are included in the market survey (sec. 5.4.2) and the evaluation (sec. 5.4.4) sections.

5.4.2 Market Survey Results

An extensive market survey was conducted to identify commercially available escape respirators. The market survey consisted of a solicitation of manufacturers, the review of previously conducted market surveys, literature searches, and consultation with SMEs. In order to provide detailed information on each respirator, 38 data fields were identified. These data fields were developed by SMEs and approved for distribution by the government. Definitions for the escape respirator data fields are provided in appendix P.

The market survey resulted in the identification of 19 escape respirators, 13 APER type respirators and six self-contained respirators. The escape respirator data sheets, along with an index identifying each of the escape respirators, are included in appendix Q.

Table 5–8 details the number of respirators identified for each of 14 vendors that were included in the market survey.

Table 5–8. Escape respirators identified for each vendor

Vendor	APER	SCBA	Total
Avon Protection Systems	1		1
Draeger	1		1
Duram Mask A.C. Ltd.	1		1
Essex PB&R		1	1
First Line Technology	1		1
Global Secure	1		1
ILC Dover, LP	1		1
International Safety Instruments		2	2
Interspiro		1	1
Mine Safety Appliances Company	2		2
North Safety Products	1	2	3
Potomac Protection Products	1		1
Quick Protective Systems Inc.	2		2
Safety Equipment America (The SEA Group)	1		1
Total	13	6	19

5.4.3 Selection Factors for Escape Respirators

An initial set of selection factors for respiratory equipment emerged from the review of the *Guide for the Selection of Personal Protective Equipment for Emergency First Responders* (NIJ Guide 102–00) as well as the draft *Report on the Market Survey and Assessment of Alternative and Supplemental Personal Protective Equipment*. These factors were then shared with experienced scientists and engineers who have multiple years of experience in PPE, domestic preparedness, and identification of emergency first responder needs. The factors were also shared with the emergency first responder community in order to get their thoughts and comments. The selection factors were modified to eliminate some of the initial criteria, include new criteria, and expand several definitions.

These factors were developed to allow for a quick comparison of commercially available escape respirators. *It is important to note that the evaluation conducted using the selection factors was based solely upon vendor-supplied data and no independent evaluation of equipment was conducted in the development of this guide.* The vendor-supplied data can be found in its entirety in appendix Q.

The results of the evaluation of the escape respirators are provided in section 5.4.4. The remainder of this section defines each of the selection factors. Details on the manner in which the selection factor was used to assess the escape respirators are included within the section factor definition.

5.4.3.1 NIOSH Approval

This selection factor indicates the NIOSH approval number associated with the escape respirators. These approval numbers take one of the following two forms:

- TC-13F-XXXX.
- TC-14G-XXXX.

The acronym “TC” stands for Testing/Certification. The “13F” is a schedule category that corresponds to SCBAs. The “14G” is a schedule category that corresponds to gas masks. The last four numbers represents the approval number that NIOSH has assigned to a specific respirator. For those respirators having CBRN approval, an additional designation of “CBRN” is included in the evaluation table in section 5.4.

5.4.3.2 Market Price

Market price details the cost associated with the respirator and a CBRN cartridge (if sold separately). The price indicated is the commercial price associated with the respirator at the time that this guide was published. This price is not a special Government price.

5.4.3.3 Sizes Available

This criterion indicates if the respirator’s sizing is one-size-fits-all or is available in multiple sizes.

5.4.3.4 Nose Cup

This selection factor indicates if the respirator has a nose cup. A nose cup helps reduce CO₂ as well as moisture in a hood.

5.4.3.5 Protection Duration

Protection duration indicates the amount of time the equipment provides adequate protection in a CBRN environment. The NIOSH CBRN Standard for APERs requires that escape respirators be rated as 15 min, 30 min, 45 min, or 60 min respirators.

Protection Duration	
●	Greater than 30 min
◐	30 min
◑	15 min
◒	Less than 15 min
⊗	Not specified

5.4.3.6 Weight

This selection factor details the weight associated with a donned and functioning escape respirator. If a filtration canister is required with the escape respirator, the weight of the canister is included in the total weight as well. The NIOSH CBRN Standard for APERs does not include any weight requirements.

Weight	
●	1 lb or less
◐	Greater than 1 lb but less than or equal to 3 lb
◑	Greater than 3 lb but less than or equal to 5 lb
◒	Greater than 5 lb
⊗	Not specified

5.4.3.7 Donning Time

This selection factor details the amount of time required to don the mask such that it is functioning for the user. The NIOSH CBRN Standard for APERs requires the time to don the respirator from the ready-to-use configuration to be no greater than 30 s.

Donning Time	
●	Less than or equal to 10 s
◐	Greater than 10 s and less than or equal to 20 s
◑	Greater than 20 s and less than or equal to 30 s
◒	Greater than 30 s
⊗	Not specified

5.4.3.8 Useful Life

This selection factor indicates the length of time an escape respirator can remain deployed in the “ready to use” stowed condition. As indicated in the NIOSH CBRN Standard for APERs, useful life requirements for escape respirators should not exceed 5 yr.

Useful Life	
●	5 yr
◐	Less than 5 yr but greater than or equal to 4 yr
◑	Less than 4 yr
⊗	Not specified

5.4.3.9 Optional Colors

This selection factor indicates the number of colors in which the escape respirator can be purchased. The NIOSH CBRN Standard does not contain any color requirements.

Optional Colors	
●	Custom colors are available
◐	2 or more colors
◑	1 color
⊗	Not specified

5.4.3.10 Package Volume

This selection factor indicates the package volume associated with the respirator. The package volume is a product of the length, width, and height of the packaged respirator.

Package Volume	
●	0.05 ft ³ or less
◐	Greater than 0.05 ft ³ and less than or equal to 0.10 ft ³
◑	Greater than 0.10 ft ³ and less than or equal to 1.00 ft ³
◒	Greater than 1.00 ft ³
⊗	Not specified

5.4.4 Evaluation of Escape Respirators

The evaluation results for the escape respirators are presented in tabular format, table 5–9, for the 19 escape respirators identified at the time this guide was written.

Table 5–9. Escape respirator evaluation results

ID Number		NIOSH Approvals	Market Price	One Size Fits All	Nose cup	Protection Duration	Weight	Donning Time	Useful Life	Color Options Available	Package Volume
AIR PURIFYING ESCAPE RESPIRATORS											
1	Avon EH20	None		YES	YES	●	⊗	●	●	⊗	●
2	Dräger DefendAir Gas Mask R54838	TC–14G–266	\$170	YES	YES	●	⊗	●	●	⊗	○
3	DURAM CEMBAYO CHEM/BIO ESCAPE MASK DM-54C-HV-YE/BL	None	\$129	YES	YES	●	●	●	⊗	●	●
4	ILC Dover SCape CBRN 30 6000-10435	TC–14G–0277 CBRN-APER	\$185	YES	NO	●	●	●	●	●	●
5	MSA Safe Escape 10002048, 49, 70	TC–14G–0276 CBRN-APER	\$170	NO	YES	●	●	●	●	●	●
6	MSA Response™ Escape Hood	None		NO	YES	●	●	●	●	⊗	●
7	North Escape Respirator (ER2000CBRN)	TC–14G–0281 CBRN-APER	\$140	YES	YES	●	●	●	●	●	●
8	POTOMAC® Emergency Escape Mask P3	None	\$100	YES	YES	●	●	●	⊗	●	●
9	Quick Protective Systems, Inc. Quick2000®	None	\$125	YES		●	●	●	●	●	●
10	Quick Protective Systems, Inc. QuickPro®	None	\$130	YES	YES	●	●	●	●	●	●
11	SafetyTech Chemihood	Discontinued Item	\$180	YES	YES	⊗	●	●	●	⊗	⊗
12	Scott SCRAM® Escape Respirator	TC–13F–88	\$302	NO	NO	●	●	●	●	●	●
13	SWEDE NBC Escape Hood TST311-720207F	None	\$175	YES	YES	●	●	●	●	●	●
14	The SEA Group SR 77 WMD Escape Hood 50061	None	\$302	NO	YES	●	●	●	●	●	●
SELF CONTAINED BREATHING APPARATUS											
15	Essex PB&R Victim Rescue Unit+ VRU	None	\$839	YES	NO	●	●	●	●	⊗	●
16	Interspiro Spiroscape Escape SCBA w/Hood 95300-12	TC–13F–485	\$500	YES	YES	●	⊗	●	⊗	⊗	⊗
17	ISI Emergency Escape Breathing Apparatus CEEBA 10*	TC–13F–525	\$710	NO	YES	●	●	●	●	●	●
18	ISI Emergency Escape Breathing Apparatus EEBA10*	TC–13F–471	\$447	NO	NO	●	●	●	●	●	●
19	North Emergency Escape Breathing Apparatus** 845, 850, and 855	TC–13F–172 TC–13F–195 TC–13F–198	\$500		NO	⊗	⊗	⊗	⊗	●	

* Five min versions of the ISI Products are also available.

† A 10 min version of the Spiroscape is also available.

‡ A hydration system is offered for the QuickPro®. This increases the cost to \$150.

§ The QuickPro® is the commercial version of the JCESM.

|| The Quick 15 will replace the Quick 2000 and will be NIOSH CBRN approved.

Market price includes one mask and one CBRN canister (if appropriate).

** Five min (42 lpm and 75 lpm) and 10 min (42 lpm) versions.

5.4.4.1 Air-Purifying Escape Respirators

Fourteen APERs capable of providing CBRN protection were identified and evaluated for this guide. As of March 2006, three of the 14 APERs have been certified to the NIOSH CBRN APER Standard. These are the ILC Dover SCape® CBRN30, the MSA Safe Escape™ CBRN Respirator, and the North Escape Respirator (ER2000CBRN) pictured in figures 5–42, 5–43, and 5–45, respectively. In addition, the Dräger DefendAir Gas Mask and the Scott SCRAM Escape Respirator have been certified to 42CFR Part 48 for industrial use. As of October 2006, the Safety Tech Chemihood has been discontinued due to low sales. Descriptions of each of the 14 APERs are provided in the remainder of this section. Descriptions are based on vendor-supplied data, which can be found in appendix P.

5.4.4.1.1 Avon EH20 Escape Hood

The Avon EH20 Escape Hood is a single-use portable Escape hood that provides at least 20 min protection from principal airborne CBRN threat agents and potential splashes, allowing escape to a safe area. It comes in one-size-fits-most adults, has a high-protection factor, and can be donned in less than 30 s. The Avon EH20 Escape Hood can be carried on a utility belt or in a briefcase. It is foil packed for a 10 yr shelf life. The EH20 Escape Hood and the foil pouch, manufactured by Avon Protection, are shown in figure 5–39.



Figure 5–39. EH20 Escape Hood and Foil Pouch, Avon Protection Systems

5.4.4.1.2 Dräger DefendAir® Gas Mask

The Dräger DefendAir® Gas Mask, shown in figure 5–40, provides 15 min protection against CBRN respiratory threats. It comes as a one-size-fits-all and can be donned in less than 10 s. This respirator comes with a combination canister that includes the P100 filter (appropriate media for BRN threats). The ASZM-TEDA allows for the filtration of chemicals. The lens provides an 80 % field of view. Optional accessories include a training unit, carrying bag, and training video/CD. The DefendAir® Gas Mask has a useful life of 5 yr.



Figure 5–40. DefendAir[®] Gas Mask, Dräger Safety

5.4.4.1.3 Duram CEMBAYO Chem/Bio Escape Mask

The Duram CEMBAYO Chem/Bio Escape Mask provides short-term respiratory protection during escape from an area of low concentration of chemical or biological agents. It comes in one-size-fits-all and can be donned within seconds. The hood protects the entire head and seals the neck. The visor is made from ETFE film that allows >95 % light transmission. The multi-layer filter assembly includes an external fire resistant screen; a HEPA filter; activated charcoal cloth with special impregnation to absorb toxic gases; and a soft inner pad of nonwoven material. CEMBAYO Chem/Bio Escape Mask, available in two colors (yellow and black), is stored in a personal pocket size carrying pouch, and an optional wall-mounted box is available for storing two or three masks. Figure 5–41 shows the CEMBAYO Chem/Bio Escape Mask manufactured by Duram Mask A.C. Ltd.



Figure 5–41. CEMBAYO Chem/Bio Escape Mask, Duram Mask A.C. Ltd.

5.4.4.1.4 ILC Dover SCape[®] CBRN30

The ILC Dover SCape[®] CBRN30 Hood received NIOSH CBRN certification on October 31, 2005 (TC–14G–0277). It was approved without the CO option, which means that it has not been approved for escape use in a carbon monoxide environment. The SCape[®] CBRN30, provides 30 min of protection against CBRN respiratory threats. Unlike most escape respirators, the ILC

Dover SCape[®] Hood is powered by an instant-on 64 lpm blower to create a positively pressured hood. It comes as a one-size-fits-all, can be donned in less than 10 s, and can be used by persons with glasses and/or facial hair. The filter canister provides protection against a range of military agents per MIL-PRF-5160 and NIOSH TRAs. A HEPA filter provides biological/radiological/particulate protection. Its clear hood with large visor allows the user to use a phone or other communications devices. Protection factor testing was completed in accordance with NIOSH Laboratory Respiratory Protection Level (LRPL) test protocol, with an average fit factor²⁶ (FF) of 97 953 for the 60 test trials. Other features include a comfortable neck seal, blower indicator light, and 5 yr shelf life. Figure 5–42 shows the SCape[®] CBRN30 from ILC Dover.



Figure 5–42. SCape[®] CBRN30, ILC Dover

5.4.4.1.5 MSA Safe Escape[™] CBRN Respirator

The MSA Safe Escape[™] CBRN Respirator received NIOSH CBRN certification on October 24, 2005 (TC–14G–0276). It was approved without the CO option, which means that it has not been approved for escape use in a carbon monoxide environment. The Safe Escape[™] CBRN Respirator is a clear-hood style with bonded lens and CBRN canister for 15 min escape protection. It is sized for individual fit (S, M, and L), identifiable by color and letter on the hexagonal storage case. The tactical version has black and gray labels. Minimal training is needed for quick and easy donning. It has a CBRN HEPA filter and activated carbon canister. The translucent hood design with a one-piece large bonded lens offers a wide field of view. The nose cup helps reduce lens fogging and CO₂ buildup. The Escape[™] CBRN Respirator has a useful shelf life of 5 yr. Accessories include an optional carrying strap and harness, trainer respirators and canisters, bilingual instruction manual, training DVD, and neck and nose cup sizing kit. Figure 5–43 shows the Safe Escape[™] CBRN Respirator from Mine Safety Appliances Company.

²⁶ Fit Factor is defined as the ratio of the challenge concentration outside the hood to the concentration inside the hood.



Figure 5–43. Safe Escape CBRN Respirator, Mine Safety Appliances Company

5.4.4.1.6 MSA Response™ Escape Hood

MSA Response™ Escape Hood with CBA/RCA canister is a clear hood manufactured with a high-performance laminate material. The canister contains a pleated high-efficiency (P-100) filter to remove aerosols, radio nuclides, and solid particulates, and an impregnated activated carbon bed to adsorb gases and vapors. The canister used in the hood contains 50 % more carbon than similar canisters used by the U.S. military. The Response Escape Hood has a large lens and translucent hood to allow better visibility, face recognition, and help reduce claustrophobia, and an integrated nose cup, so wearers can breathe and speak normally. Its unique nose cup also helps reduce lens fogging and carbon dioxide buildup by directing airflow inside the hood. The hood is suitable for high-profile office environments, government agencies or embassies, or law enforcement or first responders. It fits most any size and is compatible with long hair, glasses, or a beard. Figure 5–44 shows the Response™ Escape Hood from Mine Safety Appliances Company.



Figure 5–44. Response™ Escape Hood, Mine Safety Appliances Company

5.4.4.1.7 North Escape Respirator (ER2000CBRN)

The North Escape Respirator (ER2000CBRN) received NIOSH CBRN certification on February 27, 2006 (TC–14G–0281). It was approved without the CO option, which means that it has not been approved for escape use in a carbon monoxide environment. The Escape Respirator (ER2000CBRN) provides 30 min protection against CBRN respiratory threats, is available as a

one-size-fits-all, and can be donned in less than 30 s. The unit has dual cartridges mounted low and on the side versus a single canister mounted in the front, to allow for better weight distribution and better visibility. It is hooded with a neck dam. The single lens does not contain coatings. The carrying bag is part of the CBRN NIOSH approval. Color coding is not available, although custom logo/markings may be considered based upon market demand. Figure 5–45 shows the Escape Respirator (ER2000CBRN) from North Safety Products.



Figure 5–45. Escape Respirator (ER2000CBRN), North Safety Products

5.4.4.1.8 POTOMAC[®] Emergency Escape Mask

The POTOMAC[®] Emergency Escape Mask, designed by Helsatech[®] of Germany, is an ultra compact emergency escape mask that provides certified protection for biological and chemical terror threats, including anthrax, cyanide, sarin, and smallpox. It is a silicone, facial-conforming mask that comes as a one-size-fits-most adults and can be donned in less than 6 s. The mask has double activated military-grade carbon filters for optimum protection. It has excellent speech transmission; telephones, cell phones and microphones can be easily used while wearing the mask. Its ultra compact size will allow users to fit the mask into a purse or briefcase. The Potomac Escape Hood has not been NIOSH CBRN certified but meets the following European certification: European Conformance Standard CE–0158; European Norm (EN) 403:1993 HCN; and European Norm (EN) 149:2001 FFP3. The POTOMAC[®] Emergency Escape Mask, developed by Helsatech GmbH, is shown in figure 5–46.



Figure 5–46. POTOMAC[®] Emergency Escape Mask, Helsatech GmbH

5.4.4.1.9 Quick Protective Systems Quick2000®

The Quick2000® is a one-size-fits-all Chemical Biological Escape Hood Respirator (CBEHR) that can be donned in 10 s. The Quick2000® meets and/or exceeds the CBEHR standard created by RDECOM (formally SBCCOM), and 95.0 % of test subjects meet or exceed: 6667 protection factor (PF). The filter system is positioned in front of and below the wearer's mouth so it does not interfere with outward vision. The cartridge is packed with military grade ASZM-TEDA carbon, and a P100 filter is sealed to the front of the cartridge. Breathing is accomplished by means of a "snorkel type" mouthpiece inside the hood, and a nose clip is used to prevent inhaling or exhaling through the nose. The large, anti-fog visor provides excellent outward vision. Related accessory items include a practice/training hood, a protective carry case, and a video. The Quick2000®, manufactured by Quick Protective Systems, Inc., is shown in figure 5-47.



Figure 5-47. Quick2000®, Quick Mask, Quick Protective Systems, Inc.

5.4.4.1.10 Quick Protective Systems QuickPro®

The QuickPro® Escape Hood provides increased protection from most biological and chemical agents. The low-profile design cartridge is packed with ASZM-TEDA carbon. A mechanical HEPA filter is intergraded with the cartridge. The hood is a one-size-fits-all and requires no fit testing. Key benefits of the QuickPro Escape Hood include its reduced package size, increased filter capacity, the ability to communicate, a drink tube that provides the capability to stay hydrated, and low breathing resistance. Over 50 % of test subjects meet or exceed a 50000 protection factor (PF), and over 75 % meet or exceed 10000 PF.

The Joint Service Chemical Environment Survivability Mask (JSCESM) was just given the approval for limited production. The mask, commercial name Quick Pro, was developed by Quick Protective Systems and Survivair, and is now designated as the XM52. It is a neck-dam type hooded respirator with a nose-cup. Figure 5-48 shows the QuickPro Escape Hood and the XM52 developed by Quick Protective Systems, Inc.



Figure 5–48. QuickPro® and SM52, Quick Protective Systems, Inc.

5.4.4.1.11 SafetyTech Chemihood

The SafetyTech Chemihood is a protective hood for self-rescue that provides effective respiratory protection against NBC hazards; it is suitable for use in chemical accidents such as in HAZMAT transport and within the chemical or nuclear industries. The Chemihood material is resistant to CAs and caustic gases, e.g., hydrogen chloride, hydrogen fluoride, and organics. It is made of a flexible laminate, integrated with a large polycarbonate visor that has a lateral field of vision of 75 %. The elastometric collar, which automatically seals around the neck, in conjunction with the internal oral/nasal half mask prevents leakage. The Chemihood is easy to don and use because of the self-adjusting strap and can be used with personal eye glasses. The storage life of the Chemihood is greater than 10 yr.

The Chemihood includes the SafetyTech International™ M95 Canister. It is compatible with all standard NATO military or commercial filter canisters and with SafetyTech International™ C220, C411 or C420 Powered Air Purifying Respirators (PAPRs). The Chemihood has a high protection factor that equates with a full face mask (protection factor breathing zone >1000). Figure 5–49 shows the Chemihood from SafetyTech International, Inc. NOTE: According to the manufacturer, this product has been discontinued.



Figure 5–49. Chemihood, SafetyTech International, Inc.

5.4.4.1.12 Scott SCRAM® Escape Respirator

The SCRAM is a semi-closed circuit emergency escape breathing device (EEBD) that provides 15 min protection against liquid and vapor chemicals, as well as biological contaminants. The SCRAM® is NIOSH approved for escape from emergency situations, including IDLH environments. Unlike most escape respirators, the SCRAM is a 15 min oxygen-generating respirator with a Venturi nozzle that pulls hood gas through a CO₂ scrubber. The escape respirator is a lightweight hood design to accommodate glasses and facial hair, which can be donned easily in confined spaces. The storage life of the SCRAM is greater than 15 yr. The SCRAM® Escape Respirator, from Scott Health and Safety, is shown in figure 5–50.



Figure 5–50. SCRAM® Escape Respirator, Scott Health and Safety

5.4.4.1.13 SWEDE NBC Escape Hood

This civilian APR is ideal for protecting people and first responders who may unexpectedly find themselves in a contaminated environment. The Tyvek “F” material and interchangeable A2B2E2K2 P3 filter provides excellent chemical resistance to all known chemical and biological agents for up to 60 min respiratory protection. The hood is easily donned with glasses, long hair, and facial hair. It has a silicone half mask that directs airflow and prevents CO₂ buildup and fogging. The panoramic visor enhances peripheral vision. The SWEDE NBC Escape Hood has a greater than 5 yr useful life. Figure 5–51 shows the highly visible SWEDE NBC Escape Hood from First Line Technology.



Figure 5–51. SWEDE NBC Escape Hood, First Line Technology

5.4.4.1.14 The SEA Group SR 77 WMD Escape Hood

The SR 77 WMD Escape Hood is a combined smoke/escape hood for NBC (nuclear, biological, chemical) warfare agents, fire, smoke, toxic gases, particles, and industrial chemicals. The hood is equipped with gas filter SR 331-2, ABEK1-CO, and particulate filter SR 510, P3. The hood is available in two sizes, fitting most adults and teenagers; requires no fit-testing; and offers up to 60 min protection. The hood can be put on quickly and simply without prior adjustment. A silicone half mask is inside the hood, and can be equipped with a voice amplification system on special request. A written respiratory protection program is available, and a manual and video disk can be sent at no charge if requested by customer. The SR 77 WMD Escape Hood is delivered in a contingency bag made of nylon and designed for mounting on a belt. The SR 77 has a greater than 5 yr useful life. SR 77 WMD Escape Hood, from Safety Equipment of America (The SEA Group), is shown in figure 5–52.



Figure 5–52. SR 77 WMD Escape Hood, Safety Equipment America (The SEA Group)

5.4.4.2 Self-Contained Escape Respirators

Five self-contained escape respirators capable of providing CBRN protection were identified and evaluated for this guide. As of February 2006, none of the self-contained escape respirators have been certified to the NIOSH CBRN SCBA Standard, although four have been certified to 42CFR Part 48 for industrial use. These include the Interspiro Spiroscape Escape SCBA with Hood, the ISI Emergency Escape Breathing Apparatus (CEEBA), the ISI Emergency Escape Breathing Apparatus (EEBA), and the North Emergency Escape Breathing Apparatus (EEBA).

Descriptions of each of the five SCBA-type escape respirators are provided in the remainder of this section. Descriptions are based on vendor-supplied data, which can be found in appendix P.

5.4.4.2.1 Essex PB&R Victim Rescue Unit+

The Essex PB&R VRU+ is a self-contained closed circuit rebreather system intended for trained individuals in rescue and escape situations from chem/bio agents, fire, smoke, and toxic fumes. Oxygen (flow is begun by semi-automatic activation) flows into the hood and is breathed and rebreathed by the user. The hood is a one-size-fits-most, dons and doffs in seconds, and offers up to 60 min protection, depending on the situation and location of the user. The system allows two-way communication and 360° visibility. Training units are available and on-line product manuals and information updates are available. The VRU+ is folded and sealed inside a multi-

laminated pouch, which can be packaged a variety of ways, including inside a fire-resistant container. In addition, the VRU+ can be easily stored or mounted for industrial settings and can be donned in the near zero visibility atmosphere that may accompany a fire. The VRU+ Victim Rescue Unit, from Essex PB&R, is pictured in figure 5-53.



Figure 5-53. VRU+ Victim Rescue Unit, Essex PB&R

5.4.4.2.2 Interspiro Spiroscape Escape SCBA with Hood

The Interspiro Spiroscape Escape SCBA with Hood is a NIOSH-approved 10 min or 15 min constant-flow escape SCBA for nonfirefighting individuals in hazardous environments. The system features an inner mask with exhalation valve and air supply tube. The patented auto hatch/safety valve opens automatically if air supply is exhausted. The unique quick-start pull tab activates air prior to donning the hood. The Spiroscape has 3000 psi. Figure 5-54 shows the Spiroscape Escape SCBA with Hood from Interspiro.



Figure 5-54. Spiroscape Escape SCBA with Hood, Interspiro

5.4.4.2.3 ISI Emergency Escape Breathing Apparatus (CEEBA)

ISI Emergency Escape Breathing Apparatus (CEEBA) is NIOSH approved as an escape device from atmospheres that have suddenly become IDLH. It is easy to don, allowing the wearer to begin escape in just seconds. The CEEBA is available in two versions, the 5 min (CEEBA 5) or the 10 min (CEEBA 10) cylinder. CEEBA 5 cylinders are 2216 psi, and CEEBA 10 cylinders are 3000 psi. The CEEBA is equipped with a compact demand valve (CDV) allowing air on demand instead of a constant flow rate of 40 lpm. The CEEBA also incorporates the ISI

AirHood that is available in two sizes (CEEBA 5—S and M; CEEBA 10—L and XL). It is available in polyurethane for cold usage or a PVC material, which is more chemical resistant. A compact pouch contains the complete unit and can be carried around the waist, neck, or over the shoulder. Instructions are printed clearly on the outside of the pouch for easy reference. Figure 5–55 shows the Emergency Escape Breathing Apparatus (CEEBA) manufactured by International Safety Instruments.



Figure 5–55. Emergency Escape Breathing Apparatus (CEEBA), International Safety Instruments

5.4.4.2.4 ISI Emergency Escape Breathing Apparatus (EEBA)

The ISI Emergency Escape Breathing Apparatus (EEBA) provides respiratory protection for escape from IDLH atmospheres. The EEBA is available in two versions, the 5 min (EEBA 5) or 10 min (EEBA 10) cylinder. EEBA 5 cylinders are 2216 psi, and EEBA 10 cylinders are 3000 psi. Both have initial flow rates of 36 lpm to 39 lpm. The EEBA comes standard with a PVC hood for chemical resistance and durability, and upon request, a polyurethane hood for cold weather operations is available. It is easy to use and can be donned in seconds (instructions are printed clearly on the outside of the pouch for easy reference). The clear hood allows full peripheral vision and can be worn with glasses, facial hair, or long hair. The unit is totally self-contained inside the bright carrying pouch which can be stored in work areas or carried around the waist, around the neck, or over the shoulder. A hard shell carrying case is available, which can be mounted to a wall or vehicle. Figure 5–56 shows the Emergency Escape Breathing Apparatus (EEBA) manufactured by International Safety Instruments.



Figure 5–56. ISI Emergency Escape Breathing Apparatus, International Safety Instruments

5.4.4.2.5 North Emergency Escape Breathing Apparatus (EEBA)

North Emergency Escape Breathing Apparatus (EEBA) complete SCBA type systems include either 5 min low-flow or 10 min low-flow (average airflow of 42 lpm) systems or a 5 min high-flow (average airflow 75 lpm) system. All three systems are NIOSH/MSHA compliant. The systems each have a transparent hood made of durable polyurethane with a deflector that blows incoming air onto the lens to minimize fogging, and a pressure reducing valve with a simple to use on/off valve with pressure gauge that allows for easy testing and checking air cylinder pressure. They are stored in a high visibility carrying bag and strap system that can be easily found in an emergency. The 10 min 42 lpm system has an orange carrying bag; the 5 min 42 lpm and the 5 min 75 lpm systems have yellow carrying bags. Pictorial user instructions on the bags are easy to understand in an emergency situation. Figure 5–57 shows the Emergency Escape Breathing Apparatus (EEBA) from North Safety Products.



Figure 5–57. Emergency Escape Breathing Apparatus (EEBA), North Safety Products

6. MICROCLIMATE COOLING TECHNOLOGIES (MCC)

Microclimate cooling (MCC) technologies are used to reduce the hazards of heat stress on personnel caused by high environmental temperatures, humidity, and work loads, as well as heat that is trapped by any protective equipment worn. Increased body temperature for extended periods of time can lead to heat stress, which can cause cognitive and physical fatigue, incapacitation of personnel, and in severe cases, brain damage or death. Research shows that body cooling can allow longer mission times at an increased level of efficiency, with reduced health risks to personnel.

Cooling garments are usually worn over large areas of the body, primarily the chest and back. Tests have shown that cooling the chest and back is more efficient at reducing the body's core temperature than cooling the arms and legs. However, in some instances for added cooling, cooling systems are added to the arms and legs in addition to the chest and back. Cooling systems for the head and neck are also common, but these systems often have lower heat removal rates since excessive cooling of the head and neck may lead to headaches and discomfort.

MCC is generally grouped into two categories: active cooling and passive cooling. Active cooling systems utilize a power source to circulate a cooling fluid (either liquid or gas) over the body. The cooled fluid removes body heat through conduction, convection, evaporation, or a combination of these processes. Passive systems absorb body heat and dissipate it into the environment, utilize the body heat to generate an endothermic (heat absorbing) process, or both. Passive systems are usually completely self-contained and require no power requirement during operation.

Cooling technologies for MCC garments may include passive evaporative, passive phase change, conditioned air, and active liquid. Cooling sources for active cooling systems may include thermoelectric, vapor compression, venturi tubes, and phase change materials (including ice). In some cases, systems combine more than one of these technologies for more effective cooling. The identified technologies as well as the advantages and disadvantages of each are discussed in section 6.2. These are general characteristics of currently available systems and do not represent every example.

It is important to remember that not all systems may be appropriate to the mission. Mission duration, operational area, environmental conditions, work load, and other equipment used must all be considered when selecting an MCC system. For example, passive evaporative cooling systems may not be suited for personnel operating in fully encapsulating chemical protective ensembles because the water vapor generated by the operation of the system can become trapped within the ensemble. Likewise, conditioned air systems may require modifications to the relief valves on chemical protective suits to prevent "blow out" of valves or seams.

6.1 Standards and Requirements

Currently there are no regulatory standards that address the safety or protective qualities of MCC. However, rigorous screening and application of fire fighter health maintenance standards,

such as NFPA 1582, Comprehensive Occupational Medical Program for Fire Departments, and NFPA 1583, Health-Related Fitness Programs for Fire Fighters, must be adapted and applied to all responders who wear PPE. Strict NFPA and OSHA guidelines exist to limit the negative health consequences that can occur when individuals with known medical conditions must don PPE for emergency response.

6.2 Market Survey Results

A market survey was conducted to identify MCC technologies that are being used in commercial off-the-shelf and government off-the-shelf MCC devices. In addition, emerging technologies were considered as well. The market survey started with the review of the *Evaluation of Commercial Off-the-Shelf and Government Off-the-Shelf Microclimate Cooling Devices*.²⁷ This review was then followed by Internet searches and discussions with SMEs.

This effort resulted in the identification of two groupings of MCC systems (passive and active) and four categories of MCC technologies (evaporative, phase change, conditioned air, and liquid cooled). Within the phase change technology are two subcategories (ice and non-ice); within the conditioned air technology are two subcategories (vapor compression and venturi tubes); and within the liquid cooled technology are three subcategories (vapor compression, ice, and thermoelectric). The cooling technologies are presented in tabular form (table 6–1).

Table 6–1. Microclimate cooling technologies

Group	Technology	Cooling Technique		
Passive	Evaporative			
	Phase change	Ice	Non-ice	
Active	Conditioned air	Vapor compression	Venturi tubes	
	Liquid cooled	Vapor compression	Ice	Thermoelectric

As table 6–1 indicates there are two groupings of MCC technologies, passive and active. Within these two groupings are four cooling technologies: evaporative, phase change, conditioned air, and liquid cooled. These technologies are further categorized according to the cooling technique utilized. Details of the cooling technologies are included in the market survey (sec. 6.1.2) section. **NOTE: Pictures used are examples of each technology and may not be representative of all features of a technology.**

6.2.1 Passive Evaporative

Passive evaporative systems utilize the heat absorbed from the wearer’s body to evaporate water that is stored in a gel or specially developed crystals. The gel or crystals are usually built into a garment that allows the water vapor to be released into the surrounding air.

Advantages to evaporative cooling garments include the following:

- Ease of activation—activation occurs when the garment is immersed in water for a specified period of time. The crystals or gel absorb many times their own weight in

²⁷ Evaluation of Commercial Off-The-Shelf and Government Off-The-Shelf Microclimate Cooling Systems, U.S. Army Research, Development, and Engineering Command, Natick Soldier Center, Natick, Massachusetts, August 2005.

water and release it slowly. The system can be activated wherever there is a source of water.

- Efficient—water is a very efficient cooling medium based on the amount of heat required for evaporation.
- Safe—substances used in these systems are usually nontoxic, and the systems pose no mechanical or intrinsic electrical hazards.
- Self-contained—external power, cooling sources, or pass-through devices are not required for operation of these systems.

Disadvantages to evaporative cooling garments include:

- Weight—heavy when compared to other cooling garments, although the weight is reduced as the water evaporates.
- Humidity—high relative humidity environments limit the amount of evaporation, and thus cooling capacity.
- Water vapor—water vapor generated by these systems limits their use in areas of poor ventilation or when used with encapsulating protective equipment.

Figure 6–1 shows three examples of passive evaporative MCC cooling devices: a scarf, a head wrap, and a vest.



Figure 6–1. Passive evaporative cooling devices

6.2.2 Passive Phase Change

Phase change systems use a garment with a phase change material (PCM) either placed in pockets or integrated into the garment itself. The phase change material must be worn close to the body because body heat causes an endothermic reaction that changes the solid material to a liquid. Absorbed heat is then dissipated into the outside air.

Advantages to passive phase change cooling garments include:

- Self-contained—external cooling source or pass-through devices are not required.
- Adjustable—materials can be chemically engineered to change phase at various temperatures.

Disadvantages to active liquid cooling garments include:

- Preparation—activation requires keeping PCM below phase change temperature for a specified period of time.
- Weight—may be heavy compared to components of other systems.

- Limited control—cooling cannot be controlled once the packets have been utilized.
- Limited duration—finite cooling period based on workload and environmental conditions.
- Freezing temperatures (ice-based)—discomfort associated with frozen packs in close proximity to the skin.

6.2.2.1 Non-Ice-Based Passive System

Non-ice-based passive phase change systems use chemical compounds that remain solid until a specified temperature is reached. The compounds are contained within packets that are inserted into a garment or are permanently built into the garment. Many systems offer packets that contain different compounds for different phase change temperatures. Figure 6–2 shows two views of a non-ice-based MCC cooling vest. The one picture shows the vest as worn and the other shows the inserted cooling packets inside the cooling vest.



Figure 6–2. Non-ice based MCC cooling system

6.2.2.2 Ice-Based Passive System

Ice-based passive phase change systems use packs that contain compounds that must be frozen prior to use. The packets are primarily water based, but sometimes the packets contain additional chemicals that allow the packets to remain flexible when frozen. Since these chemicals thaw at a higher temperature than water, discomfort associated with the frozen packets in close proximity to the skin is reduced. The packets are inserted into the garment, or are permanently built into the garment. Figure 6–3 shows two views of an ice-based MCC cooling vest. The one picture shows a vest with inserted cooling packets, and the other shows the containers for the frozen liquid.



Figure 6-3. Ice-based cooling system

6.2.3 Conditioned Air

An active conditioned air system provides cooling by passing dry air over the body to increase the speed of natural evaporation of sweat. Some systems are more complex than others, but the systems usually consist of an air source, a means of drying the air, a hose, and a suitable garment. In environments where humidity is relatively low, ambient air can be used and the air dryer can be eliminated. The means of drying the air varies from system to system, but most systems either use a heat exchanger or a venturi tube to remove the moisture. Both of these systems rely on the fact that cool air holds less moisture than warm air.

6.3.3.1 Heat Exchangers (Vapor Compression)

A heat exchanger is a device that is used to transfer heat from one fluid to another. The heat exchanger in an MCC is the area where the warm, moist air passes over or through an area that has been cooled to a low temperature. The greater the differential between the temperature of the air and the temperature of the cooler, the more efficient is the system.

Many systems use a vapor compression system (similar to a home refrigerator or air conditioner) to cool the heat exchanger, and other systems use ice. A blower sends warm, moist air through the heat exchanger, where the air is cooled. As the air cools, the amount of water vapor contained in the air is reduced. This air is then sent to a distribution system within a cooling garment where it is warmed and thus absorbs water vapor produced from sweat. There are currently no commercially available heat exchanger conditioned air cooling systems; however, there are developmental and military systems that may be commercially available in the future.

6.2.3.2 Venturi Tubes

Some systems require a source of pressurized air that is connected to a venturi tube, a specialized tube with a small opening. As the air passes through the small opening in the venturi tube it is pressurized further. After the air passes through the opening, it moves into an expansion chamber. As the air expands, the pressure is reduced, and in turn, the air is cooled and dried. This air is then sent to a distribution system within a cooling garment where it is warmed and absorbs water vapor from the evaporation of sweat. Figure 6-4 shows a venturi tube, the line connecting the venturi tube to the vest, and a cooling vest.

Advantages to conditioned air cooling garments include:

- Continuous operation—cooling provided as long as there is power or pressurized air to the system.
- Adjustable—airflow controls the amount of cooling.
- Reliable—functions with little effect even with small holes in the hose.
- Maintainability—hose and garment can be repaired with tape or other patch materials.
- Weight (garment)—lightweight relative to other types of systems.
- NBC usage— system creates a positive pressure within protective garments (which prevents intrusion by CB contaminants) with adequate filters and relief valves to allow flow of air out of the suit.

Disadvantages to conditioned air cooling garments include:

- Portability—user must be tethered to a blower unit.
- Minimal residual cooling—virtually all cooling is lost if power is lost or the hose is disconnected.
- Pass-through— required opening in the outer garment to allow the hose to reach the cooling garment.



Figure 6-4. Venturi tube, the connecting line, and cooling vest

6.2.4 Liquid Cooled

An active liquid cooling system uses tubing, either sewn or glued to the inside of a garment, to act as a path for cooled liquid to pass through. As the cooled liquid passes through the tubing, which is in close proximity to the body, it absorbs the body heat and carries it away to a heat exchanger where it is cooled and recycled back through the garment.

6.2.4.1 Ice-Based Active Liquid Systems

In ice-based systems, the fluid is cooled as it passes through a heat exchanger that is cooled with ice. In many cases, the water that results from the melting of ice acts as both the heat exchanger and the cooling fluid. Figure 6-5 shows the components of an active ice-based liquid cooling system.



Figure 6-5. Active ice-based liquid cooling system

6.2.4.2 Vapor Compression Active Liquid Systems

A vapor compression system operates similarly to a home refrigerator or air conditioner, which utilize the Venturi Effect. The Venturi Effect is based on the physical properties of fluids that temperature and pressure are directly proportional. Utilizing the Venturi Effect, pressurized fluid is forced through a small opening into an area of lower pressure, and as the pressure of the fluid drops, the temperature of the fluid also drops. In a vapor compression system, the pressurized fluid is referred to as a refrigerant and the medium that absorbs the heat is the cooling fluid. After the cooled refrigerant absorbs the heat from the cooling fluid in a heat exchanger, it travels through the system to a compressor, where the pressure is increased as it moves into an expansion chamber. In the expansion chamber, the pressurized refrigerant expands rapidly, and the temperature drops. The cooled refrigerant returns to the heat exchanger, and the cycle starts again. There are currently no commercially available vapor compression liquid cooling systems; there are however, developmental and military systems that may be commercially available in the future.

6.2.4.3 Thermoelectric Active Liquid Cooled

Thermoelectric systems use an electric charge to cool a heat exchanger, which then cools a fluid that passes over it. These systems require a garment which carries the fluid over the body of the wearer. Thermoelectric systems can be used with conditioned air or active liquid systems.

Advantages to active liquid cooling garments include:

- Continuous operation—cooling provided as long as there is power to the system.
- Adjustable—cooling adjusted by controlling the amount of liquid, or by cycling a pump on and off.
- Portable—battery powered pump may be optional.

Disadvantages to active liquid cooling garments include:

- Pass-through—required opening in the outer garment to allow the hose to reach the cooling garment.
- Heavy (vapor compression)—heavy compared to other cooling systems.
- Preparation and set-up—initial set-up requires purging air from the liquid lines.
- Maintenance—breaks in lines may cause liquid loss and reduction in cooling.
- Heat generation (thermoelectric)—produces significant heat from the cooling unit.

- Inefficient (thermoelectric)—relatively inefficient compared to other cooling technologies.

Figure 6–6 shows the components of a thermoelectric liquid cooled system.



Figure 6–6. Components of a thermoelectric liquid cooled system

6.3 Selection Factors for MCC Technologies

An initial set of selection factors for MCC emerged from the review of the *Report on the Market Survey and Assessment of Alternative and Supplemental Personal Protective Equipment*. These factors were then shared with experienced scientists and engineers who have multiple years of experience in PPE, domestic preparedness, and identification of emergency first responder needs. The factors were also shared with the emergency first responder community in order to get their thoughts and comments. The selection factors were modified to eliminate some of the initial criteria, include new criteria, and expand several definitions. These factors were developed to allow for a quick comparison of MCC technologies.

The remainder of this section defines each of the selection factors. Details on the manner in which the selection factors were used to assess MCC technologies are based upon past market surveys, SMEs’ expertise and knowledge of MCC technologies, and currently fielded MCC equipment. No independent evaluation of the equipment was conducted in the development of this guide. The results of the evaluation of the MCC technologies are provided in section 6.4. Table 6–2 shows the measures that were used to evaluate the MCC technologies.

Table 6–2. Measures used to evaluate MCC technologies

Measures	
●	Excellent
◐	Very good
◑	Good
◒	Fair
○	Poor
⊗	Not applicable

6.3.1 Cooling Unit Weight

This selection factor assesses the weight of the unit that is used to provide the cooling, including any additional components needed to operate the system (such as blowers and compressors). Generators, power converters, refrigerators, freezers, and storage coolers for ice that are not part of the system are not considered part of the cooling unit.

6.3.2 Cooling Garment Weight

This selection factor assesses the weight of the garment that is used to distribute the cooling. Cooling packs, hoses permanently attached to the garment, and any fluid contained in the garment during operation is included in this weight.

6.3.3 Readiness

This selection factor addresses the ability with which the system can be prepared prior to use. This preparation includes, but is not limited to, immersing cooling packs, connecting hoses, connecting power, and purging air from systems. Time to freeze ice packs is not included.

6.3.4 Cooling Capacity

This selection factor indicates how long the MCC system can keep the user cool.

6.3.5 Heat Removal Rate

This selection factor indicates how well the MCC system can reduce the heat being generated by the wearer.

6.3.6 Compatibility

This selection factor assesses how well the system can be used with other garments commonly in use by personnel using MCC systems. This includes whether other equipment needs to be modified in any way in order to use the cooling system. An example of incompatibility with equipment would be the requirement for a pass-through or the water vapor being trapped inside of an encapsulating garment.

6.3.7 Monitoring and Control

This selection factor assesses the ease with which the MCC system can be monitored and controlled by the wearer. This monitoring and control would consist primarily of determining when cooling packs require changing, or in the case of powered systems, when a change in a setting is warranted, as well as the ability to make necessary changes.

6.3.8 Environmental Conditions

This selection factor addresses the recommended operating environment of the system. The system should be capable of operation or transportation in hot and cold temperatures, during precipitation, in high humidity, and in dusty environments (including contaminated dusty environments). All materials used in the system should be flame resistant and intrinsically safe.

6.3.9 Shock and Vibration

This selection factor addresses the amount of shock that the system can withstand. It is possible that the system will need to withstand off-road operations or vibration from storage/use in vehicles. This criterion is applicable to both the vest and any associated equipment (blowers, cooling packs, etc.) under all climatic conditions, including high heat and extreme cold.

6.3.10 Durability

This selection factor addresses how well the system is expected to withstand normal use in typical conditions experienced by those that wear MCC systems.

6.3.11 Portability

This selection factor addresses how easily the system can be moved from one place to another. Weight, power requirements, and physical dimensions are critical to portability.

6.4 Evaluation of MCC Technologies

An evaluation of MCC technologies was conducted by SMEs to determine how the technologies compare to each other. It is important to keep in mind that there is no established standard for microclimate cooling systems. Table 6–3 details the evaluation results of the MCC technologies identified in the market survey against each of the selection factors. This information is presented for comparative purposes only.

Table 6-3. MCC technology evaluation

ID Number	Brand and Model	Weight (Cooling Unit)	Weight (Garment)	Readiness	Cooling Capacity	Heat Removal Rate	Compatibility	Monitoring and Control	Environmental Conditions	Shock and Vibration	Durability	Portability
PASSIVE												
1	Ice Phase Change	⊗	◐	◑	◑	◑	●	◐	◑	◑	◑	●
2	Non-Ice Phase Change	⊗	◑	◑	◑	◑	●	◐	◑	●	●	●
3	Passive Evaporative	⊗	◐	●	◑	◑	◐	◐	◐	●	●	●
ACTIVE CONDITIONED AIR												
3	Vapor Compression	○	●	◐	◑	●	◐	◑	◑	◐	◑	○
4	Venturi Tubes	○	●	◐	◑	◑	◐	◑	◑	◐	◑	○
ACTIVE LIQUID COOLED												
5	Vapor Compression	◑	◑	◐	◑	◑	◐	◑	◑	◐	◑	○
6	Ice	◑	◑	◐	◑	●	◐	◑	◑	◐	◑	◐
7	Thermoelectric	◑	◑	◐	◑	◑	◐	◑	◑	◐	◑	◐

APPENDIX A—REFERENCES

REFERENCES

1. Armando S. Bevelacqua and Richard H. Stilp, *Terrorism Handbook for Operational Responders*, Emergency Film Group, Edgartown, MA, January 1998.
2. Robert E. Hunt, Timothy Hayes; Warren B. Carroll, *Guidelines for Mass Casualty Decontamination During a Terrorist Chemical Agent Incident*, Battelle, Columbus, OH, September 1999.
3. A.K. Stuempfle, D.J. Howells, S.J. Armour, C.A. Boulet, *International Task Force 25: Hazard from Industrial Chemicals Final Report*, Edgewood Research Development and Engineering Center, Aberdeen Proving Ground, MD, AD-B236562, ERDEC-SP-061, April 1998.
4. *Responding to A Biological or Chemical Threat: A Practical Guide*, U.S. Department of State, Bureau of Diplomatic Security, Washington, DC, 1996.
5. *2004 Emergency Response Guidebook, A Guidebook for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Incident*, produced jointly by Transport Canada, the U.S. Department of Transport, and the Secretariat of Transport and Communications of Mexico. Published in Canada by Canadian Government Publishing, 2004.
6. *Potential Military Chemical/Biological Agents and Compounds*, FM 3–9, AFR 355–7; NAVFAC P-467, Army Chemical School, Fort, McClellan, AL, December 12, 1990.
7. *Draft Report on the Market Survey and Assessment of Alternative and Supplemental Personal Protective Equipment*.
8. *Evaluation of Commercial Off-the-Shelf and Government-Off-the-Shelf Microclimate Cooling Systems* (finalized in August 2005), NATICK.
9. Kenneth Barbalace. 2004 ERG (*Emergency Response Guidebook*)—Online. EnvironmentalChemistry.com. 1995–2006.
<http://EnvironmentalChemistry.com/yogi/hazmat/erg/index.html>.
10. http://www.spokanerisk.org/risk_&_safety_manual.htm.

**APPENDIX B—IMMEDIATELY DANGEROUS TO LIFE AND HEALTH
VALUES (IDLH)**

**APPENDIX B—IMMEDIATELY DANGEROUS TO LIFE AND HEALTH VALUES
(IDLH)**

Chemical Name	Chemical Abstract Service No.	MW	Mg/m³	IDLH (PPM)
GA/Tabun	77-81-6	162.1	0.1	0.0151
GB/Sarin	107-44-8	140.1	0.1	0.0175
GD/Soman	96-64-0	182.2	0.05	0.00671
GF	329-99-7	180.2	0.05	0.00678
VX	50782-69-9	267.4	0.003	0.00027
H/Mustard	505-60-2	159.1	0.7	0.10757
L/Lewisite	541-25-3	207.3	0.00254	0.0003

Chemical Name	Chemical Abstract Service No.	MW	Mg/m³	IDLH (PPM)
1,2-Dimethylhydrazine	540-73-8	60.10	36.87	15
Acetone cyanohydrin	75-86-5	85.10		
Acrolein	107-02-8	56.07	4.59	2
Acrylonitrile	107-13-1	53.07	184.5	85
Allyl alcohol	107-18-6	58.09	47.52	20
Allyl chlorocarbonate	2937-50-0	120.534		
Allyl isothiocyanate	57-06-7	99.16		
Allylamine	107-11-9	57.11		
Ammonia	7664-41-7	17.04	209.08	300
Arsenic trichloride	7784341	181.27		
Arsine	7784-42-1	77.95	9.56	3
Boron tribromide	10294-33-4	250.54		
Boron trichloride	10294-34-5	117.16	95.83	20
Boron trifluoride	7637072	67.81	69.34	25
Bromine	7726956	159.80	19.61	3
Bromine chloride	13863417	115.36		
Bromine pentafluoride	7789302	174.91		
Bromine trifluoride	7787715	136.91	139.989	25
Carbon disulfide	75-15-0	76.13	1556.9	500
Carbon monoxide	630-08-0	28.01	1374.7	1200
Carbonyl fluoride	353504	66.01		
Carbonyl sulfide	463-58-1	60.07		
Chlorine	7782-50-5	70.90	29	10
Chlorine pentafluoride	13637633	130.45		
Chlorine trifluoride	7790912	92.45	75.62	20
Chloroacetaldehyde	107200	78.50	144.5	45
Chloroacetone	78-95-5	92.53		

Chemical Name	Chemical Abstract Service No.	MW	Mg/m ³	IDLH (PPM)
Chloroacetonitrile	107-14-2	75.50		
Chloroacetyl chloride	79049	112.94		
Chlorosulfonic acid	7790-94-5	116.52		
Crotonaldehyde	4170303	70.09	143.3	50
Cyanogen chloride	506774	61.47		NA
Diborane	19287-45-7	27.67	16.98	15
Diketene	674-82-8	84.08		
Dimethyl sulfate	77781	126.14	36.1	7
Dimethylhydrazine	57-14-7	60.12	36.9	15
Diphenylmethane-4,4'-diisocyanate	101-68-8	250.3	75	
Diphosgene	503-38-8	197.8	16.18	2
Ethyl phosphonic dichloride	2025-56-1	29.06		
Ethyl phosphonothioic dichloride	993-43-1	163.006		
Ethyl chloroformate	541413	108.53		
S-Ethyl chlorothiolformate	2941-64-2	124.590		
Ethylene dibromide	106-93-4	187.88	768.4	100
Ethylene oxide	75-21-8	44.06	1441.6	800
Ethyleneimine	151564	43.08	176.2	100
Fluorine	7782-41-4	38.00	38.85	25
Formaldehyde (37 %)	50-00-0	30.03	24.56	20
Hexachlorocyclopentadiene	77474	272.75		
Hydrazine	302-01-2	32.05	65.54	50
Hydrogen bromide	10035-10-6	80.92	99.3	30
Hydrogen chloride	7647-01-0	36.46	74.6	50
Hydrogen cyanide	74-90-8	27.03	11.055	10
Hydrogen fluoride	7664-39-3	20.01	24.55	30
Hydrogen iodide	10034-85-2	127.91		
Hydrogen selenide	7783075	80.98	3.31	1
Hydrogen sulfide	7783064	34.08	139.4	100
Iron pentacarbonyl	13463406	195.90		
Isobutyl chloroformate	543-27-1	136.58		
Isopropyl chloroformate	108236	122.56		
Isopropyl isocyanate	1795-48-8	85.105		
Methanesulfonyl chloride	124630	114.55		
Methyl bromide	74839	94.95	970.9	250
Methyl chloroformate	79-22-1	94.50		
Methyl chlorosilane	993-00-0	80.59		
Methyl hydrazine	60-34-4	46.07	37.69	20

Chemical Name	Chemical Abstract Service No.	MW	Mg/m ³	IDLH (PPM)
Methyl isocyanate	624-83-9	57.06	7	3
Methyl mercaptan	74-93-1	48.11	295.2	150
n-Butyl chloroformate	592-34-7	136.58		
n-Butyl isocyanate	111-36-4	99.13		
Nitric acid, fuming	7697-37-2	63.02	64.44	25
Nitric oxide	10102439	30.01	122.7	100
Nitrogen dioxide	10102-44-0	46.01	37.64	20
n-Octyl mercaptan	111-88-6	146.29		
n-Propyl chloroformate	109-61-5	122.55		
Parathion	56382	291.28	9.53	0.8
Perchloromethyl mercaptan	594423	185.87	76.02	10
Phosgene	75-44-5	98.91	8.09	2
Phosphine	7803-51-2	34.00	69.53	50
Phosphorus oxychloride	10025873	153.32		
Phosphorus pentafluoride	7647-19-0	125.97		
Phosphorous trichloride	7719122	137.32	280.818	50
sec-Butyl chloroformate	17462-58-7			
Selenium hexafluoride	7783-79-1	192.96	15.78	2
Silicon tetrafluoride	7783-61-1	104.08		
Stibine	7803-52-3	124.78	25.52	5
Sulfur dioxide	7446095	64.06	262.09	100
Sulfur trioxide	7446119	80.06	3.27	1
Sulfuric acid, concentrated	7664-93-9	98.08	16.05	4
Sulfuryl chloride	7791-25-5	134.96		
Sulfuryl fluoride	2699-79-8	102.06	834.85	200
Tellurium hexafluoride	7783-80-4	241.60	9.88	1
tert-Butyl isocyanate	1609-86-5	99.13		
n-Octyl mercaptan	111-88-6	146.3		
Tetraethyl lead	78002	323.47	39.69	3
Tetraethyl pyrophosphate	107493	290.22	4.75	0.4
Tetramethyl lead	78002	323.47	36.69	3
Titanium tetrachloride	7550-45-0	189.70		
Toluene 2,4-diisocyanate	584849	174.17	17.81	2.5
Toluene 2,6-diisocyanate	91087	174.17	17.81	2.5
Trichloroacetyl chloride	76-02-8	181.82		
Trifluoroacetyl chloride	354-42-5	132.47		
Tungsten hexafluoride	7783-83-6	297.85		

APPENDIX C—ENSEMBLE DATA FIELDS

APPENDIX C—ENSEMBLE DATA FIELDS

Forty-seven data fields were used to provide information relating to NFPA certified ensembles. The 47 data fields are comprised of data fields from the market survey vendor questionnaire requesting specifics about their certified ensembles. Because of the database limitations, several data fields on the vendor questionnaire were combined, but all the vendor-supplied information was entered into the database. All data fields were developed using input from the emergency responder community.

The data fields are grouped according to the following five parameters and the number of data fields in each parameter:

- General (14 data fields).
- Capabilities (5 data fields).
- Human Factors (10 data fields).
- Logistics and Training (14 data fields).
- Special Requirements (4 data fields).

1.0 General

1.1 Product Information

Product information, including name, model, and/or stock number, is used to identify the ensemble. The stock and/or model number indicates the number(s) that are used to uniquely identify the equipment. It should include the stock identification or national stock number, if the suit has one.

1.2 Manufacturer

Manufacturer identifies the company that manufactured the suit (to include the name, address, telephone number(s), fax number, and point-of-contact).

1.3 Source

Source indicates where the suit information was obtained. Potential sources include past market surveys, internet websites, conferences, or commerce business daily announcements.

1.4 Information Last Updated

This data field indicates when the information was last updated by the vendor.

1.5 NFPA Certification Status

This data field indicates if the product has been certified to NFPA standards, such as NFPA 1994 (2001 Edition) and includes the certification organization, the certification number, and

the certification date. It also indicates the prognosis for future certification. Classifications relevant to this report are included in the following list:

- *Level A, NFPA 1994 Class 1.*
- *Level A, NFPA 1991 (2005 Edition).*
- *Level B, NFPA 1994 Class 2.*
- *Level B, NFPA 1994 Class 3.*
- *Level B, NFPA 1992 (2005 Edition).*
- *NFPA 1991 with CB Option.*
- *Level C.*

1.6 Required Boots and Gloves

This data field identifies the boots and gloves (with vendor and model number) with which the ensemble is certified, sold, or recommended for use.

1.7 Other Certifications

Other certifications that the ensemble may have received [i.e., OSHA, NIOSH, NFPA (other than 1994), ANSI/ISEA 105 or mil-standards, etc.] are included in this data field.

1.8 Independent Testing Information

Independent testing information includes any test data obtained from sources regarding any part of the equipment (e.g., validation testing including materials and ensemble testing such as abrasion, tear, wear, burst, and permeation testing). Human factors testing results should be included as well (either quantitative or qualitative).

1.9 Material Technology

Material technology describes the material or process by which the protective ensemble provides protection against CBRN and/or TICs/TIMs. Traditional hazardous materials response suits are constructed from nonpermeable barrier films, membranes or textiles. Military chemical protective ensembles couple inner adsorptive carbon layers with liquid-resistant outer shell textiles. The developer/supplier/manufacturers of barrier films, membranes and textiles, closures, and interface systems (such as “glove to sleeve” and “boot to cuff”) that are used in the protective ensemble is also included in the technology field.

1.10 Ensemble Description and Unique Features

The suit description category provides an overall description of the ensemble including any unique features that make the ensemble different or attractive. Descriptions should include specifics on closure methods, boot interface, glove interface, and hood interface.

1.11 Design and Configuration

The design and configuration data field details any features the suit or manufacturer offers for addressing difficulties between suit sizes and the various body types. One example would be that the suit itself may fit appropriately, but the large inner glove is not conducive for some people with smaller hands. Another example would be that the suit offers drawstrings or other mechanisms to help people whose arms are smaller than the suit is designed for.

Factors to consider include the following:

- *Suit adjustability to accommodate various body types. This will address suit sizing (i.e., does the suit offer the ability to adjust the size to allow for a better fit of various body types).*
- *Suit adjustability to accommodate bulky equipment.*
- *Point of entry—front or rear entry design.*
- *Required elements for the ensemble (boots, gloves, respiratory equipment, etc.).*
- *Internal structural support (e.g., the STEPO).*
- *Donning/doffing time and assistance will be noted.*
- *Pass-through options.*

1.12 Unit and Component Cost

The unit and component cost includes details on the complete suit cost, as well as individual component costs.

1.13 Availability

Availability indicates the lead time for acquiring initial quantities of an ensemble after the order has been placed. The data field also includes whether the ensemble is in stock or if it is manufactured on demand.

1.14 References/User(s) of Product

*References/user(s) of product identifies organizations (i.e., military use, commercial applications, civil-service instrument, etc.) that are currently using the ensemble. This information may include the average number of units each client has in operation and the average number of years these units have been in use. **References must be verified with consent from the users before including the contact information.***

2.0 Capabilities

2.1 Chemical Agents Protected Against

This data field indicates the type and state (i.e., liquid, vapor, or aerosol) of CAs the ensemble protects against. The most common types of classic CAs are the nerve and blister agents. Nerve agents include GA (tabun), GB (sarin), GD (soman), GF, and VX. Blister agents include H and

HD (sulfur mustards), HN (nitrogen mustard), and L (lewisite). This field should include details on the types of testing and the results related to manufacturer testing.

2.2 Biological Agents Protected Against

This data field indicates the type and state (i.e., liquid, vapor, or aerosol) of BAs the ensemble protects against. Classical BA types include bacteria (anthrax), rickettsia (typhus), toxins (botulinum toxin), and viral (smallpox). This field should include details on the types of testing and the results related to manufacturer testing.

2.3 Toxic Industrial Chemicals/Material Protected Against

This data field indicates the type and state (i.e., liquid, vapor, or aerosol) of TICs/TIMs the ensemble protects against. TICs/TIMs are used in a variety of settings such as manufacturing facilities, maintenance areas, and storage areas.

2.4 Duration of Protection

This data field indicates the amount of time the ensemble provides adequate protection. Since duration varies depending on the concentration of agent, type of agent, and environmental conditions, duration will be given with respect to specific conditions. NFPA 1994 requires 60 min (it is important to note that most missions are around 90 min) of protection; however, many ensembles exceed this requirement, so it is reasonable to assume that ensembles can offer 2 h, 3 h, or 4 h of protection.

2.5 Ensemble Application

This data field identifies the areas where the ensemble will most likely be used per vendor or manufacturer recommendation (e.g., tactical operations, crisis management, etc.), or those areas where the ensemble should not be used (i.e., in a flammable environment, etc.). This data field will indicate if the garment portion of the ensemble is made using flame-resistant material (as demonstrated by meeting NFPA 1991 material flame resistance requirements or by testing to ASTM D 6413 or ASTM F 1358 with an average after-flame time of less than 2 s and average char length/burn distance less than 4 in without melting and dripping).

3.0 Human Factors

3.1 Ensemble Weight

This data field provides the weight of an average configuration of the ensemble (size large, no boots or gloves unless attached) in pounds. This data field should also include the unit area weight and the thickness of the material used to construct the ensemble.

3.2 Comfort

ASTM F 1154 Standard Practice for Qualitatively Evaluating the Comfort, Fit, Function, and Integrity of Chemical-Protective Suit Ensembles is a complex process based on wearer feedback.

It provides information about the suitability of the suit in the work environment on the basis of comfort, fit, form, function, and integrity.

3.3 Construction Type

This data field indicates how seams are sealed. This field should also include the number of seams and the linear estimate of each seam.

3.4 Color

The color data field indicates the available colors of the suit. The data field should also include if the ensemble is available in special colors or camouflage.

3.5 Dexterity Performance Reduction

Dexterity is the ability to manipulate fine instruments and pick up fine objects using the gloves that are integrated into the suit. The dexterity performance tests are based on a set performance reduction compared to bare hand control. The scale ranges from 200 % to 450 % to 600 %. These values compare to NFPA 1994 Class 3, 2, and 1 gloves, respectively. Performance reduction is based on a percent decrease in manipulation while wearing the gloves compared with bare hand control.

3.6 Visibility

Visibility includes visual acuity and impact on the field of view (FOV) as it applies to totally encapsulated suits or suits designed and configured with hood and visor.

- *Visual acuity for a person with 20/20 vision, either corrected or uncorrected, should result in visual acuity better than 20/35 while looking through the visor.*
- *Field of view [Level A, NFPA 1994 Class 1, or NFPA 1991 (2005 edition)] is the percentage of visibility that a user has while wearing the protective ensemble and a respirator. An expected field of view is at least 70 % under these conditions. The size of the face shield and information on the impact of fogging, if applicable, is an important consideration for field of view.*

3.7 Don/Doff Information

Don/doff information indicates whether the system requires assistance for donning and/or doffing and includes the average time for this activity.

3.8 Operational Limitations

This data field refers to the length of time responders can safely work at various temperatures (i.e., 50 °F, 70 °F, and 90 °F) without experiencing heat stress. Limitations with cold temperatures should also be indicated.

3.9 Microclimate Cooling

This data field indicates the availability/compatibility of MCC systems to help manage heat stress. The existence of, or the ability to include pass-thru(s) for MCC should be indicated.

3.10 Environmental Conditions

Environmental conditions indicate whether the suit is designed for use in all common outdoor weather conditions and climates (e.g., rain, snow, extreme temperatures, and humidity) or only under relatively controlled conditions. In order to evaluate the environmental performance of the ensemble, information should be based on ensemble environmental performance measures. NFPA 1994 Paragraphs: 7.1.2.4 (Class 1) and 7.2.2.4 (Class 2)¹ should be provided.

4.0 Logistics and Training

4.1 Technical Data Package

A technical data package (TDP) provides instruction with respect to maintenance and shelf life, the relevant factors to be considered are maintenance requirements, in-service performance and inspection procedures, environmental storage conditions, and estimated shelf life.

4.2 Cleanability

Cleanability includes the cleaning procedures that are safe for the item, including the number of times it can be cleaned and remain efficacious (assuming that the suit has not been contaminated). Also, cleanability includes any special procedures needed for specific components. Some suits are made for “one time” use or “one time” threat exposure only; others are able to be cleaned several times.

4.3 Cleaning Products

This field provides recommended products or the suitability of available cleaning products.

4.4 Use/Reuse

Use/reuse indicates the need for any part of the ensemble to be discarded after use or its ability to be reused. The data field includes the procedures used to decontaminate and/or dispose of used equipment.

4.5 Training Requirements/Hours

Training requirements refers to the amount of instruction time the operator needs to become proficient in using the suit. The data field considers initial outfit testing and the man hours required to get certification to use the equipment. Training adds to the overall comfort level of

¹ NFPA 1994 Standard on Protective Ensembles for Chemical/Biological Terrorism Incidents, 2001 Edition.
<http://www.tnema.org/Library/Misc/1994.pdf>

the users by reassuring them that they have adequate protection while performing the mission. The difficulty of operating the equipment has an impact on the primary user for added reassurance of protection. The availability of sustained training for the unit, annual or periodic, is also part of training requirements. This data field also indicates if the suit is certified in the NFPA training procedures.

4.6 Training Available

This data field refers to the type of training provided by the manufacturer. This includes any initial training and recertification training that is available.

4.7 Manuals Available

Manuals available from the manufacturer include user manuals, instructions for donning and doffing, instructions for cleaning, and training documentation, to name a few.

4.8 Shelf Life

Shelf life is the length of time the suit can be stored under normal storage conditions before it needs to be replaced. Shelf life for sealed packages under normal storage conditions can typically be 5 yr, 10 yr, or as long as 15 yr. In some cases, gloves are stored in extraordinary storage conditions, which could shorten the shelf life.

4.9 Storage Conditions

Storage conditions are the recommended storage procedures and environment, and include any factors that decrease shelf life (e.g., UV, critical temperature, etc.). This data field also includes specific test data, if available.

4.10 Maintenance Frequency

Maintenance requirements include the services, parts, and estimated costs required to keep the suit at its peak operational readiness (e.g., preventative maintenance) and the frequency of required maintenance (e.g., after use, quarterly, annually, etc.). Details on leakage or pressure testing should be included here. The relevant factors for maintenance requirements include in-service performance inspection procedures and if a TDP is provided.

4.11 Consumables

Consumables (e.g., gloves or booties) are the supplies used during operation and storage. This data field also provides specific information on costs associated with consumables and frequency of replacement.

4.12 Storage/Package Size and Volume

The package size and volume data field provides the external dimensions of the suit and components when packaged (for storage and transportability). This factor is important because of the limited space within emergency vehicles.

4.13 Storage/Package Shape

Package shape is important when considering storing and transporting the suit (i.e., requirements may differ if the product package will be stored in a warehouse or on a vehicle).

4.14 Sizes Available

This data field refers to the variety of sizes available to the first responder community. One-size-fits-all may be attractive for certain items but may not serve the responder community that is made up of diverse personnel. The gender of the emergency response personnel should be considered when evaluating diversity in body size and shape. Sizing categories, as defined in the American National Standard for Limited-Use and Disposable Coveralls—Size and Labeling Requirements, ANSI/ISEA 101–1966, are X-small, small, medium, large, X-large, XX-large, and XXX-large.

5.0 Special Requirements

5.1 Health Hazards and Safety

Health hazards identify all materials associated with the ensembles that possess a potential health hazard or allergic reaction (i.e., latex). This field should indicate if there are any regulations associated with the suit materials, to include any government and/or safety regulations that may apply to the possession, use, or storage of any part of the suit. Applicable material safety data sheets should be referenced in this field as well. Copies of the MSDS should be provided and will be appropriately linked to this field.

5.2 Communications Interface Capability

Communications interface capability refers to the ability of the suit to interface with a communications system (network capability; hardwire capability; RF communication, etc.).

5.3 EOD Compatibility

This data field identifies the ability of the protective footwear to be used with an EOD (protective bomb suit) protective system.

5.4 Warranty

Warranty is the length of time a piece of equipment is guaranteed by the manufacturer, including the terms of the warranty (parts and labor). This data field also includes specific details on what

is covered in the warranty, along with the effective lifetime of the warranty, any restrictions in place by the manufacturer, the specific parts and labor that are covered, and the expected useful lifetime of the equipment.

APPENDIX D—ENSEMBLE INDEX AND DATA SHEETS

APPENDIX D—ENSEMBLE INDEX AND DATA SHEETS

ID#	Item Name	Model	Manufacturer	Page D-#
1	Tychem® Responder®, Front Entry Level A Garment, Certified to NFPA 1994 Class 1	RS612T	DuPont Personal Protection	D-1
2	Tychem® Responder®, Rear Entry Level A Garment, Certified to NFPA 1994 Class 1	RS613T	DuPont Personal Protection	D-6
3	Tychem® TK, Front Entry Level A Garment, Certified to NFPA 1994 Class 1	TK612T	DuPont Personal Protection	D-11
4	Tychem® TK, Rear Entry Level A Garment, Certified to NFPA 1994 Class 1	TK613T	DuPont Personal Protection	D-16
5	Kappler Zytron™ 500 Z5HTN NFPA 1994 Class 1 Certified Ensemble	Z5HTN CH	Kappler, Inc.	D-21
6	Lakeland Tychem TK NFPA 1994 Class 1 Ensemble	TK644, TK644W, TK654, TK654W	Lakeland Industries	D-24
7	STEPO (Self Contained Toxic Environment Protective Outfit)	8415-01-454-XXXX	Saint-Gobain Performance Plastics ChemFab	D-26
8	Trellechem® VPS/VP1	VPS/VP1	Trelleborg Viking, Inc.	D-29
9	DTAPS® Level B Non-Encapsulating Coverall Ensemble	75-000 (complete ensemble)	GEOMET Technologies, LLC.	D-32
10	Tactix MT-94™	MT-94 LE, MT-94 FS	Lion Apparel	D-35
11	ITAP (Improved Toxicological Agent Protective) Ensemble	NSN 8415-01-463-5829 (Large)	Saint-Gobain Performance Plastics ChemFab	D-38
12	Tychem® CPF 3, Coverall with Short Overhood, Certified to NFPA 1994 Class 3	C3610T	DuPont Personal Protection	D-41
13	Tychem® CPF 3 NFPA 1994 Class 3 Coverall and Chest Length Overhood Ensemble	C3611T	DuPont Personal Protection	D-45
14	JetGuard® PLUS Class 3 Ensemble	5332018	Indutex S.p.A	D-49
15	Kappler Zytron™ 300 NFPA 1994 Class 3 Hooded Coverall	Z3HCF TN	Kappler, Inc.	D-51
16	CLD 420, Class 3 Protective Coverall	CLD 420	Paul Boyé	D-55
17	The Sigmon System NFPA 1994 Class 3 Ensemble (NFPA 1994 Class III Tactical Suit, Class 3)	SGDC-NFPA-T11 (Kappler Z3HCN TN)	The Sigmon Group	D-58
18	Tychem® Reflector®, Front Entry Level A Garment, Certified to NFPA 1991	RF600T	DuPont Personal Protection	D-60
19	Tychem® Responder®, Front Entry Level A Garment, Certified to NFPA 1991	RS600T	DuPont Personal Protection	D-65

ID#	Item Name	Model	Manufacturer	Page D-#
20	Tychem® Responder®, Rear Entry Level A Garment, Certified to NFPA 1991	RS601T	DuPont Personal Protection	D-70
21	Tychem® TK, Front Entry Level A Garment, Certified to NFPA 1991	TK600T	DuPont Personal Protection	D-75
22	Tychem® TK, Rear Entry Level A Garment, Certified to NFPA 1991	TK601T	DuPont Personal Protection	D-80
23	Lakeland Tychem TK NFPA 1991, 2000 Edition Ensemble	TK645, TK645W, TK655, TK655W	Lakeland Industries	D-85
24	Trellechem® HPS Type T/TE	HPS	Trelleborg Viking, Inc.	D-88
25	Tychem® ThermoPro	TP188T	DuPont Personal Protection	D-91
26	Tychem® ThermoPro	TP189T	DuPont Personal Protection	D-95
27	SE-Shield Personal Protective Ensemble/VPS	S-VPS	Safety Equipment America, Inc. (The SEA Group)	D-99
28	SE-Shield Personal Protective Ensemble/HPS	S-HPS	Safety Equipment America, Inc. (The SEA Group)	D-102
29	DTAPS® Level B Totally-Encapsulating Ensemble	70-100 (complete ensemble)	GEOMET Technologies, LLC.	D-105
30	New Pac C/91, C/91R, C/91FR and First Responder Kit	C/91, C/91R, C/91FR	New Pac Safety AB	D-108
31	SWEDE Butyl Coverall	TST320-46960xS	First Line Technology, LLC	D-111
32	DTAPS® Level A Totally-Encapsulating Suit	10-100	GEOMET Technologies, LLC.	D-114
33	Disposable Toxicological Agent Protective Suit (DTAPS®) System	10-400	GEOMET Technologies, LLC.	D-116
34	Disposable Toxicological Agent Protective Suit (DTAPS®) System	10-500	GEOMET Technologies, LLC.	D-119
35	CLD100 Protective Coverall	CLD100.29001	Paul Boyé	D-122
36	SEA Tyvek® F Single-Use Suit and Hood	50104	Safety Equipment America, Inc. (The SEA Group)	D-125
37	S/89 and Military Survival Kit	S/89	New Pac Safety AB	D-127
38	Spiratec® Hybrid	Not applicable	Texplorer®GmbH	D-129
39	Saratoga Joint Service Lightweight Integrated Suit (JSLIST)	415-01-444-XXXX	Tex-Shield, Inc.	D-132
40	Saratoga™ HAMMER Suit	TSCN0756-XX-size	Tex-Shield, Inc.	D-134
41	Frontliner CBRN Ensemble	Ensemble 001	Remploy Frontline	D-136
42	ONESuit™ TEC	1S-A-LG (Large)	Saint-Gobain Performance Plastics ChemFab	D-140

GENERAL

Tychem® Responder®, Front Entry Level A Garment, Certified to NFPA 1994 Class 1**Model:** RS612T**Stock:** RS612T (front entry)

DuPont Personal Protection
 5401 Jefferson Davis Highway
 Richmond, Virginia 23234
 Customer Service
 800-931-3456 (Tel)
 843-335-8599 (Fax)
 personalprotection@usa.dupont.com

Manufacturer Type: Domestic**Information Source:** <http://www.personalprotection.com>

Responder Knowledge Database (RKB)

Status: The vendor has responded—6/6/2005**NFPA Certification:**

NFPA 1994 Class 1, 2001 Edition

OSHA EPA Level:

Level A

NFPA Certification Number:

01C1-01-ENSM

CBT-DUP-02, 08

Certifying Organization:

SEI

Date Certified/Expected:

September 27, 2005

Intertek—Annual revivifications

Required Boots:

Onguard Industries—Hazmax (87012) boots. Boot must be worn over the integrated bootie (sold separately).

Required Gloves:

Attached glove system:

Outer Glove: Ansell Edmont #k2300-12 Kevlar®

Middle glove: Guardian #IN-35

Neoprene inner glove: Ansell Barrier® Style 2-100

Respiratory Equipment: Air-Pak® Fifty™ 2.2 SCBA

AirBoss Evolution Plus CBRN SCBA 2216 psig

AirBoss Evolution Plus CBRN SCBA 4500 psig

AirBoss PSS100 CBRN SCBA 4500 psig

AirBoss PSS100 Plus CBRN 2216 psig

BlackHawk™ Tactical Air Mask

Firehawk SCBA 2216 psig

Firehawk SCBA 4500 psig

Viking SCBA

Viking ST SCBA

Unit Cost: \$776**Availability:** In stock. If not in stock, standard lead time is 4 wk to 6 wk.**References:** Used by numerous Hazmat teams and Federal First Responders**Other Certifications:** Not applicable**Independent Testing:** Not applicable**Material Technology:** The NFPA 1994 Class 1 certified Responder® provides an extremely durable material that has been tested against more than 230 different chemicals.

Tychem® TK—A patented limited-use fabric consisting of multiple barrier films laminated to both sides of a tough substrate material. Seams are sewn and sealed with hot air welded tape. The gloves are attached to the sleeve by an inverted, rigid ring and clamp system. The garment has an attached sock with boot-top covers. A user-supplied boot must be worn over the attached sock with the boot-top covers pulled down over the upper portion of the boot to prevent liquid pooling inside the boot. Permeation and Physical Property Data are available online at: www.personalprotection.dupont.com, or you can request a copy from customer service at 800-931-3456.

Design/Configuration: Suit is adjustable to accommodate various body types. Front entry.**Ensemble Design and Description:** 1. The front entry suit shall be constructed from a multiple-layer, film-based composite material.

2. The material, seams, visor, and gloves shall demonstrate no measurable chemical permeation for a period of 1 h when tested dimethyl sulfate, lewisite, mustard, sarin, VX, ammonia, chlorine, cyanogen chloride, carbonyl chloride, and hydrogen cyanide. In addition to the NFPA test data, the manufacturer shall be able to provide chemical permeation data results against the base fabric for more than 280 chemicals.
3. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.
4. The suit shall be constructed with an airtight zipper. The zipper shall be covered by a double overlapping storm flap made of the base fabric.
5. The glove system shall consist of: a Neoprene Ansell Barrier® inner glove, a Guardian #IN-35 middle glove, and an Ansell Edmont #k2300-12 Kevlar® outer glove. The gloves shall be field replaceable by means of an internal ring and clamp system. The interface between the glove and sleeve shall form an airtight seal.
6. The view window in the suit shall be made of 40 mil polished PVC and shall have an overlay of 5 mil FEP Teflon® permanently mounted over the visor.
7. The garment shall have three pressure demand exhalation valves. The valves shall be covered by splash guards of the base material.
8. The suit shall be constructed with sock boots made from the base material to allow the use of a replaceable overboot. The boot area shall be covered by a splash guard. (NOTE: An NFPA certified boot must be worn with the suit in order to meet NFPA certification.)
9. The suit shall contain an internal waist belt system for support and improved fit.
10. The suit shall be designed to accommodate a SCBA (self-contained breathing apparatus) and shall allow for the use of an ANSI certified hard hat.
11. Each suit shall have a unique serial number. The suit shall be tested for airtight integrity prior to delivery. This test shall be conducted using positive air pressure as specified in ASTM F1052.
12. The suit shall be capable of being field tested for airtight integrity using an optional positive pressure test kit (style No. 990810).
13. The suit shall meet all the requirements set forth in NFPA 1994 Class 1 and shall be certified as such by the Safety Equipment Institute. The suit shall have proper labeling which states NFPA 1994 Certification and includes the SEI logo.
14. In addition to the certification, current permeation data must be provided on all chemicals tested against the suit fabric.

Required Elements: Attached bootie worn with outer boot and attached gloves that are replaceable
Respiratory equipment—the ensemble has the ability to accommodate pass-through(s) for respirators
Number of pass-throughs—up to 3

Pass-through options:

- ISI Pass-Through
- Draeger with Hansen Fitting Pass-Through
- Draeger with Foster Fitting Pass-Through
- Interspiro Pass-Through
- Scott with Hansen Fitting Pass-Through
- Scott with Schrader Fitting Pass-Through
- Survivair® with Foster Fitting Pass-Through
- Survivair® with Hansen Fitting Pass-Through
- Survivair® with Schrader Fitting Pass-Through
- MSA Dual Purpose with Foster Fitting Pass-Through
- MSA Dual Purpose with Hansen Fitting Pass-Through
- MSA with Schrader Fitting Pass-Through

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 1 and 1991 CB Option plus additional CA protection

BAs Protected Against: Exceeds NFPA 1994 liquid penetration and liquid biological threat protection

TIMs Protected Against: Meets 1994, 1991, and 1992 plus additional chemical threats

Rad/Nuc Materials Protected Against: Yes

Duration of Protection: Greater than or equal to 60 min and less than 119 min. Duration controlled by heat stress and respirator capability.

Acetone cyanohydrin—75-86-5—100 %—>480 min—<0.01—ASTM F 739

Acrolein—107-02-8—100 %—>480 min—<0.02—ASTM F 739

Acrylonitrile—107-13-1—100 %—>480 min—<0.1—ASTM F 739

Allyl alcohol—107-18-6—100 %—>480 min—<0.1—ASTM F 739

Ammonia—7664-41-7—100 % gas—>480 min—<0.1—ASTM F 739

Arsine—7784-42-1—100 % gas—>480 min—<0.01—ASTM F 739
Boron trichloride—10294-34-5—100 % gas—>480 min—<0.1—ASTM F 739
Boron trifluoride—7637-07-02—100 % gas—>480 min—<0.1—ASTM F 739
Carbon disulfide—75-15-0—100 %—>480 min—<0.1—ASTM F 739
Carbon monoxide—630-08-0—100 % gas—330 min—0.1—ASTM F 739
Chlorine—7782-50-5—100 % gas—>480 min—<0.1—ASTM F 739
Chloroacetone—78-95-5—100 %—>480 min—<0.08—ASTM F 739
Chlorosulfonic acid—7790-94-5—100 %—>480 min—<0.1—ASTM F 739
Diborane—19287-45-7—10 % (gas)—>480 min—<0.1—ASTM F 739
Dimethylhydrazine—57-14-7—100 %—>480 min—<0.1—ASTM F 739
Ethylene dibromide—106-93-4—100 %—>480 min—<0.1—ASTM F 739
Ethylene oxide—75-21-8—100 % gas—>480 min—<0.1—ASTM F 739
Fluorine—7782-41-4—100 % gas—>480 min—<0.1—ASTM F 739
Formaldehyde (37 %)—50-00-0—100 %—>480 min—<0.09—ASTM F 739
Hydrogen bromide—10035-10-6—100 % gas—>480 min—<0.1—ASTM F 739
Hydrogen chloride—7647-01-0—100 % gas—>480 min—<0.1—ASTM F 739
Hydrogen cyanide—74-90-8—100 % gas—>480 min—<0.1—ASTM F 739
Hydrogen fluoride—7664-39-3—100 % gas—>480 min—<0.1—ASTM F 739
Hydrogen selenide—7783-07-5—100 % gas—>480 min—<0.01—ASTM F 739
Hydrogen sulfide—7783-06-4—100 % gas—>480 min—<0.01—ASTM F 739
Methanesulfonyl chloride—124-63-0—100% —>480 min—<0.0006—ASTM F 739
Methyl chloroformate—79-22-1—100 %—>480 min—<0.01—ASTM F 739
Methyl hydrazine—60-34-4—100 %—>480 min—<0.1—ASTM F 739
Methyl isocyanate—624-83-9—100 %—>480 min—<0.1—ASTM F 739
Methyl mercaptan—74-93-1—100 % gas—>480 min—<0.1—ASTM F 739
Nitric acid, fuming—7697-37-2—100 %—>480 min—<0.033—ASTM F 739
Nitrogen dioxide—10102-44-0—100 % gas—>480 min—<0.001—ASTM F 739
Phosgene—75-44-5—100 % gas—>480 min—<0.1—ASTM F 739
Phosphine—7803-51-2—100 % gas—>480 min—<0.1—ASTM F 739
Phosphorous trichloride—7719-12-2—100 %—>480 min—<0.1—ASTM F 739
Sulfur dioxide—7449-09-05—100 % gas—>480 min—<0.1—ASTM F 739
Sulfur trioxide—7449-11-9—100 %—90 min—696—ASTM F 739
Sulfuric acid, concentrated—7664-93-9—95-98 %—>480 min—<0.1—ASTM F 739
Sulfuryl chloride—7791-25-5—100 %—>480 min—<0.1—ASTM F 739
Titanium tetrachloride—7550-45-0—100 %—>480 min—<0.1—ASTM F 739
Tungsten hexafluoride—7783-83-6—100 % gas—>480 min—<0.1—ASTM F 739

Ensemble Application: IDLH environments or atmosphere with less than 19.5 % oxygen concentration is respirator dependent. Radiation protection against radioactive particles, not ionizing neutrons, gamma-rays, or x-ray radiation. Deep frozen media depends on additional thermal protection of hands. Biological.

Flame Resistance: No

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 6.6 kg (14.57 lb)

Ensemble weight (plus components): 9.35 kg (20.62 lb)*

*weight consists of suit with Onguard Hazmax Boots, size 11, with no pass-throughs

Unit area weight of material used: 194 g/m² (8.2 oz/yd²)**

Material thickness of the ensemble: 533 μ (21 mil)**

**unit weight and thickness apply to garment material only

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted. Test subject was able to complete all tasks as specified in the standard.

Construction: The garment is constructed with double-taped seams to provide barrier against liquids, aerosols and vapors and increase durability. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric. The face shield is constructed of 2 layers; 5 mil Teflon® and 40 mil PVC.

Colors: Blue—contact customer service for special product applications

Dexterity: <600 %—based on results of NFPA certification test

Visual Acuity/Visibility: Visual acuity is better than or equal to 20/35

FOV: Not specified

Don/Doff: Assistance is required for donning and doffing. 60 s—varies with practice, skill, and whether assistance is provided.

Operational Limitations: Users should use WBGT method for heat stress environmental modeling and a clothing correction factor of 10 °C (50 °F) for hooded coveralls and higher for encapsulated ensembles. Working in hot, humid environments depends on level of work activity, rest/work cycle, health of the individual, as well as temperature, humidity, wind speed, and radiant heating.

MCC Capability: Ensemble has the ability to be used with a microclimate cooling system. User must specify pass-throughs prior to garment manufacturing.

Environmental Conditions: Ensemble has met the cold temperature performance test. Glove has met independent cold temperature performance tests and exceeds standard's requirements.

LOGISTICS/TRAINING

TDP: Technical data package is included with all NFPA certified garments. For additional copies, please call customer service at 800-931-3456.

Training:

- **Training Hours:** Level of training on Tychem® garments depends on prior qualifications and training of end user. A HazMat technician requires less product-specific training than a novice user. Training documentation is available from the manufacturer.
- **Training Required:** Level of training on Tychem® garments depends on prior qualification and training of end-user. A HazMat technician requires less product specific training than a novice user.
- **Training Available:** Name of training course—Last Line of Defense. Training does not result in certification.
- **Manuals Available:** Technical data package and permeation guide available with each suit. User manuals are included with all NFPA certified suits and all Level A suits. For additional copies, please visit our website at: www.personalprotection.dupont.com, or call customer service at 800-931-3456.

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused. See user's manual.

Cleaning Products: Garments should be clean and dry before use. Water and mild, household dishwashing liquid should be used to clean these garments. These garments may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water, and air-dried. Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. Do not dry clean these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach.

Use/Reuse: Discard if contaminated. Disposal per jurisdictional regulations.

Shelf Life: 6 yr to 10 yr—DuPont™ suggests Tychem® chemical garments can be used as long as they pass a visual inspection test, and in the case of Level A garments, the ASTM F1052 inflation test. Tychem® chemical garments do not have a fixed shelf life. DuPont™ suggests retiring garments to “Training Use Only” 5 yr after date of receipt. See storage life statement at www.personalprotection.com.

Maintenance Required: All PPE should be inspected prior to each use, refer to 29 CFR 1910, Subpart I, Personal Protective Equipment Standards for General Industry. See the DuPont™ Personal Protection (DPP) user manual for specific instructions. (Extra copies are available online at www.personalprotection.dupont.com). Maintenance frequency is before and after each use and at least annually.

Maintenance Cost: Not specified

Storage Conditions: Temperature range: <49 °C (<120 °F). Relative humidity range: 0 % to 100 %.

Preferably, garments should be stored in a cool, dark, dry location, free of dirt and insects. Sunlight, ozone, high temperatures >49 °C (>120 °F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers. Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Consumables: Not applicable

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. 4X and 5X are available.

SPECIAL PARAMETERS

Health Hazards: If the garment has elastic wrists, ankles and/or an elastic hood opening, the elastic may contain natural rubber latex

Latex/Allergens: Garment does not contain latex; Garments are considered “articles” and are exempt from MSDS reporting requirements. The garments are nonhazardous.

Communications: Ensemble has the ability to interface with a communications system. There is a minimum order requirement for NFPA 1991 and 1994 Class 1 ensembles for certification of pass-through.

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: DuPont makes no guarantee of results and assumes no obligation or liability in connection with the use of DuPont garments and accessories. It is the user's responsibility to determine the level of hazards and the proper personal protective equipment needed. DuPont warrants to the purchaser/end user only for a period of 90 d from date the garment or accessory was shipped to the purchaser/end user or, for a period of 12 mo from the date the encapsulated garment was shipped to the purchaser/end user that the garment and accessory, if any, are free of defects in materials and workmanship. Since conditions of use are outside DuPont's control, DuPont makes no other warranties of any kind, expressed or implied, including, without limitation, no warranties of merchantability or fitness for a particular use and assumes no liability in connection with any use of the DuPont garment and accessories. This warranty is void in the event any party including purchaser/end user modifies the garment or accessory in any way. The sole and exclusive remedy for all purchasers and/or end users for any and all claims, losses, injuries or damages of any kind relating to or arising from DuPont garments and accessories, shall be the refund of the purchase price or the replacement or repair of any garment or accessory found to contain a defect in materials or workmanship upon inspection by DuPont. Only DuPont shall determine the form of remedy (repair, replacement, or refund) for items containing a defect in materials or workmanship. No warranty claim shall be honored unless received by DuPont within 90 d of the date the garment or accessory was shipped to the purchaser and/or end user or, within 12 mo from the date the encapsulated garment was shipped to the purchaser/end user. In no event shall DuPont be liable for any special, incidental, indirect, punitive or consequential damages, whether arising from contract, tort, warranty, representation, instruction, design or manufacturing defects, or any other cause or theory. Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user's responsibility to determine the level of risk and the proper protective equipment needed for the user's particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent right.

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GENERAL

Tychem® Responder®, Rear Entry Level A Garment, Certified to NFPA 1994 Class 1**Model:** RS613T**Stock:** RS613T (rear entry)

DuPont Personal Protection
 5401 Jefferson Davis Highway
 Richmond, Virginia 23234
 Customer Service
 800-931-3456 (Tel)
 843-335-8599 (Fax)
 personalprotection@usa.dupont.com

Manufacturer Type: Domestic
Information Source: <http://www.personalprotection.com>
 Responder Knowledge Database (RKB)
Status: The vendor has responded—6/6/2005

**NFPA Certification:**

NFPA 1994 Class 1, 2001 Edition

OSHA EPA Level:

Level A

NFPA Certification Number:

CBT-DUP-05, 09

Certifying Organization:

SEI

Date Certified/Expected:

Intertek—Annual reverifications

Required Boots:

Onguard Industries—Hazmax (87012) boots. Boot must be worn over the integrated bootie (sold separately).

Required Gloves:

Attached glove system:
 Outer glove: Ansell Edmont #k2300-12 Kevlar®
 Middle glove: Guardian #IN-35
 Neoprene inner glove: Ansell Barrier® Style 2-100

Respiratory Equipment: Air-Pak® Fifty™ 2.2 SCBA
 AirBoss Evolution Plus CBRN SCBA 2216 psig
 AirBoss Evolution Plus CBRN SCBA 4500 psig
 AirBoss PSS100 CBRN SCBA 4500 psig
 AirBoss PSS100 Plus CBRN 2216 psig
 BlackHawk™ Tactical Air Mask
 Firehawk SCBA 2216 psig
 Firehawk SCBA 4500 psig
 Viking SCBA
 Viking ST SCBA

Unit Cost: \$776**Availability:** In stock. If not in stock, standard lead time is 4 wk to 6 wk.**References:** Used by numerous Hazmat teams and Federal First Responder**Other Certifications:** Not applicable**Independent Testing:** Not applicable

Material Technology: The NFPA 1994 Class 1 certified Responder® provides an extremely durable material that has been tested against more than 230 different chemicals.

Tychem® TK—a patented limited-use fabric consisting of multiple barrier films laminated to both sides of a tough substrate material. Seams are sewn and sealed with hot air welded tape. The gloves are attached to the sleeve by an inverted, rigid ring and clamp system. The garment has an attached sock with boot-top covers. A user-supplied boot must be worn over the attached sock with the boot-top covers pulled down over the upper portion of the boot to prevent liquid pooling inside the boot. Permeation and Physical Property Data are available online at: www.personalprotection.dupont.com, or you can request a copy from customer service at 800-931-3456.

Design/Configuration: Suit is adjustable to accommodate various body types. Rear entry.**Ensemble Design and Description:** 1. The rear entry suit shall be constructed from a multiple-layer, film-based composite material.

2. The material, seams, visor, and gloves shall demonstrate no measurable chemical permeation for a period of 1 h when tested dimethyl sulfate, lewisite, mustard, sarin, VX, ammonia, chlorine, cyanogen chloride, carbonyl chloride, and hydrogen cyanide. In addition to the NFPA test data, the manufacturer shall be able to provide chemical permeation data results against the base fabric for more than 280 chemicals.
3. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.
4. The suit shall be constructed with an airtight zipper. The zipper shall be covered by a double overlapping storm flap made of the base fabric.
5. The glove system shall consist of: a Neoprene Ansell Barrier® inner glove, a Guardian #IN-35 middle glove, and an Ansell Edmont #k2300-12 Kevlar® outer glove. The gloves shall be field replaceable by means of an internal ring and clamp system. The interface between the glove and sleeve shall form an airtight seal.
6. The view window in the suit shall be made of 40 mil polished PVC and shall have an overlay of 5 mil FEP Teflon® permanently mounted over the visor.
7. The garment shall have three pressure demand exhalation valves. The valves shall be covered by splash guards of the base material.
8. The suit shall be constructed with sock boots made from the base material to allow the use of a replaceable overboot. The boot area shall be covered by a splash guard. (Note: An NFPA certified boot must be worn with the suit in order to meet NFPA certification.)
9. The suit shall contain an internal waist belt system for support and improved fit.
10. The suit shall be designed to accommodate a SCBA and shall allow for the use of an ANSI certified hard hat.
11. Each suit shall have a unique serial number. The suit shall be tested for airtight integrity prior to delivery. This test shall be conducted using positive air pressure as specified in ASTM F1052.
12. The suit shall be capable of being field tested for airtight integrity using an optional positive pressure test kit (style No. 990810).
13. The suit shall meet all the requirements set forth in NFPA 1994 Class 1 and shall be certified as such by SEI. The suit shall have proper labeling which states NFPA 1994 Certification and includes the SEI logo.
14. In addition to the certification, current permeation data must be provided on all chemicals tested against the suit fabric.

Required Elements: Attached bootie worn with outer boot and attached gloves that are replaceable
Respiratory equipment—the ensemble has the ability to accommodate pass-through(s) for respirators
Number of pass-throughs—up to 3

Pass-through options:

- ISI Pass-Through
- Draeger with Hansen Fitting Pass-Through
- Draeger with Foster Fitting Pass-Through
- Interspiro Pass-Through
- Scott with Hansen Fitting Pass-Through
- Scott with Schrader Fitting Pass-Through
- Survivair® with Foster Fitting Pass-Through
- Survivair® with Hansen Fitting Pass-Through
- Survivair® with Schrader Fitting Pass-Through
- MSA Dual Purpose with Foster Fitting Pass-Through
- MSA Dual Purpose with Hansen Fitting Pass-Through

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 1 and 1991 CB Option plus additional CA protection

BAs Protected Against: Exceeds NFPA 1994 liquid penetration and liquid biological threat protection

TIMs Protected Against: Meets 1994, 1991, and 1992 plus additional chemical threats

Rad/Nuc Materials Protected Against: Yes

Duration of Protection: Greater than or equal to 60 min and less than 119 min. Duration controlled by heat stress and respirator capability.

Acetone cyanohydrin—75-86-5—100 %—>480 min—<0.01—ASTM F 739

Acrolein—107-02-8—100 %—>480 min—<0.02—ASTM F 739

Acrylonitrile—107-13-1—100 %—>480 min—<0.1—ASTM F 739

Allyl alcohol—107-18-6—100 %—>480 min—<0.1—ASTM F 739

Ammonia—7664-41-7—100 % gas—>480 min—<0.1—ASTM F 739

Arsine—7784-42-1—100 % gas—>480 min—<0.01—ASTM F 739

Boron trichloride—10294-34-5—100 % gas—>480 min—<0.1—ASTM F 739

Boron trifluoride—7637-07-02—100 % gas—>480 min—<0.1—ASTM F 739
Carbon disulfide—75-15-0—100 %—>480 min—<0.1—ASTM F 739
Carbon monoxide—630-08-0—100 % gas—330 min—0.1—ASTM F 739
Chlorine—7782-50-5—100 % gas—>480 min—<0.1—ASTM F 739
Chloroacetone—78-95-5—100 %—>480 min—<0.08—ASTM F 739
Chlorosulfonic acid—7790-94-5—100 %—>480 min—<0.1—ASTM F 739
Diborane—19287-45-7—10 % (gas)—>480 min—<0.1—ASTM F 739
Dimethylhydrazine—57-14-7—100 %—>480 min—<0.1—ASTM F 739
Ethylene dibromide—106-93-4—100 %—>480 min—<0.1—ASTM F 739
Ethylene oxide—75-21-8—100 % gas—>480 min—<0.1—ASTM F 739
Fluorine—7782-41-4—100 % gas—>480 min—<0.1—ASTM F 739
Formaldehyde (37 %)—50-00-0—100 %—>480 min—<0.09—ASTM F 739
Hydrogen bromide—10035-10-6—100 % gas—>480 min—<0.1—ASTM F 739
Hydrogen chloride—7647-01-0—100 % gas—>480 min—<0.1—ASTM F 739
Hydrogen cyanide—74-90-8—100 % gas—>480 min—<0.1—ASTM F 739
Hydrogen fluoride—7664-39-3—100 % gas—>480 min—<0.1—ASTM F 739
Hydrogen selenide—7783-07-5—100 % gas—>480 min—<0.01—ASTM F 739
Hydrogen sulfide—7783-06-4—100 % gas—>480 min—<0.01—ASTM F 739
Methanesulfonyl chloride—124-63-0—100% —>480 min—<0.0006—ASTM F 739
Methyl chloroformate—79-22-1—100 %—>480 min—<0.01—ASTM F 739
Methyl hydrazine—60-34-4—100 %—>480 min—<0.1—ASTM F 739
Methyl isocyanate—624-83-9—100 %—>480 min—<0.1—ASTM F 739
Methyl mercaptan—74-93-1—100 % gas—>480 min—<0.1—ASTM F 739
Nitric acid, fuming—7697-37-2—100 %—>480 min—<0.033—ASTM F 739
Nitrogen dioxide—10102-44-0—100 % gas—>480 min—<0.001—ASTM F 739
Phosgene—75-44-5—100 % gas—>480 min—<0.1—ASTM F 739
Phosphine—7803-51-2—100 % gas—>480 min—<0.1—ASTM F 739
Phosphorous trichloride—7719-12-2—100 %—>480 min—<0.1—ASTM F 739
Sulfur dioxide—7449-09-05—100 % gas—>480 min—<0.1—ASTM F 739
Sulfur trioxide—7449-11-9—100 %—90 min—696—ASTM F 739
Sulfuric acid, concentrated—7664-93-9—95-98 %—>480 min—<0.1—ASTM F 739
Sulfuryl chloride—7791-25-5—100 %—>480 min—<0.1—ASTM F 739
Titanium tetrachloride—7550-45-0—100 %—>480 min—<0.1—ASTM F 739
Tungsten hexafluoride—7783-83-6—100 % gas—>480 min—<0.1—ASTM F 739

Ensemble Application: IDLH environments or atmosphere with less than 19.5 % oxygen concentration is respirator dependent. Radiation protection against radioactive particles, not ionizing neutrons, gamma-rays, or x-ray radiation. Deep frozen media depends on additional thermal protection of hands. Biological.

Flame Resistance: No

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 6.6 kg (14.57 lb)

Ensemble weight (plus components): 9.35 kg (20.62 lb)*

*weight consists of suit with Onguard Hazmax Boots, size 11, with no pass-throughs

Unit area weight of material used: 194 g/m² (8.2 oz/yd²)**

Material thickness of the ensemble: 533 μ (21 mil)**

**unit weight and thickness apply to garment material only

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted. Test subject was able to complete all tasks as specified in the standard.

Construction: The garment is constructed with double-taped seams to provide barrier against liquids, aerosols and vapors and increase durability. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric. The face shield is constructed of 2 layers; 5 mil Teflon® and 40 mil PVC.

Colors: Blue—contact customer service for special product applications

Dexterity: <600 %—based on results of NFPA certification test

Visual Acuity/Visibility: Visual acuity is better than or equal to 20/35

FOV: Not specified

Don/Doff: Assistance is required for donning and doffing. 60 s—varies with practice, skill, and whether assistance is provided.

Operational Limitations: Users should use WBGT method for heat stress environmental modeling and a clothing correction factor of 10 °C (50 °F) for hooded coveralls and higher for encapsulated ensembles. Working in hot, humid environments depends on level of work activity, rest/work cycle, health of the individual, as well as temperature, humidity, wind speed, and radiant heating.

MCC Capability: Ensemble has the ability to be used with a microclimate cooling system. User must specify pass-throughs prior to garment manufacturing.

Environmental Conditions: Ensemble has met the cold temperature performance test. Glove has met independent cold temperature performance tests and exceeds standard's requirements.

LOGISTICS/TRAINING

TDP: Technical data package is included with all NFPA certified garments. For additional copies, please call customer service at 800-931-3456.

Training:

- **Training Hours:** Level of training on Tychem® garments depends on prior qualifications and training of end user. A HazMat technician requires less product-specific training than a novice user. Training documentation is available from the manufacturer.
- **Training Required:** Level of training on Tychem® garments depends on prior qualification and training of end-user. A HazMat technician requires less product specific training than a novice user.
- **Training Available:** Name of training course—Last Line of Defense. Training does not result in certification.
- **Manuals Available:** Technical data package and permeation guide available with each suit. User manuals are included with all NFPA certified suits and all Level A suits. For additional copies, please visit our website at: www.personalprotection.dupont.com, or call customer service at 800-931-3456.

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused. See user's manual.

Cleaning Products: Garments should be clean and dry before use. Water and mild, household dishwashing liquid should be used to clean these garments. These garments may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water, and air-dried. Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. Do not dry clean these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach.

Use/Reuse: Discard if contaminated. Disposal per jurisdictional regulations.

Shelf Life: 6 yr to 10 yr—DuPont™ suggests Tychem® chemical garments can be used as long as they pass a visual inspection test, and in the case of Level A garments, the ASTM F1052 inflation test. Tychem® chemical garments do not have a fixed shelf life. DuPont™ suggests retiring garments to “Training Use Only” 5 yr after date of receipt. See storage life statement at www.personalprotection.com.

Maintenance Required: All PPE should be inspected prior to each use, refer to 29 CFR 1910, Subpart I, Personal Protective Equipment Standards for General Industry. See the DuPont™ Personal Protection (DPP) user manual for specific instructions. (Extra copies are available online at www.personalprotection.dupont.com). Maintenance frequency is before and after each use and at least annually.

Maintenance Cost: Not specified

Storage Conditions: Temperature range: <49 °C (<120 °F). Relative humidity range: 0 % to 100 %.

Preferably, garments should be stored in a cool, dark, dry location, free of dirt and insects. Sunlight, ozone, high temperatures >49 °C (>120 °F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers. Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Consumables: Not applicable

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. 4X and 5X are available.

SPECIAL PARAMETERS

Health Hazards: If the garment has elastic wrists, ankles and/or an elastic hood opening, the elastic may contain natural rubber latex

Latex/Allergens: Garment does not contain latex; Garments are considered “articles” and are exempt from MSDS reporting requirements. The garments are nonhazardous.

Communications: Ensemble has the ability to interface with a communications system. There is a minimum order requirement for NFPA 1991 and 1994 Class 1 ensembles for certification of pass-through.

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: DuPont makes no guarantee of results and assumes no obligation or liability in connection with the use of DuPont garments and accessories. It is the user's responsibility to determine the level of hazards and the proper personal protective equipment needed. DuPont warrants to the purchaser/end user only for a period of 90 d from date the garment or accessory was shipped to the purchaser/end user or, for a period of 12 mo from the date the encapsulated garment was shipped to the purchaser/end user that the garment and accessory, if any, are free of defects in materials and workmanship. Since conditions of use are outside DuPont's control, DuPont makes no other warranties of any kind, expressed or implied, including, without limitation, no warranties of merchantability or fitness for a particular use and assumes no liability in connection with any use of the DuPont garment and accessories. This warranty is void in the event any party including purchaser/end user modifies the garment or accessory in any way. The sole and exclusive remedy for all purchasers and/or end users for any and all claims, losses, injuries or damages of any kind relating to or arising from DuPont garments and accessories, shall be the refund of the purchase price or the replacement or repair of any garment or accessory found to contain a defect in materials or workmanship upon inspection by DuPont. Only DuPont shall determine the form of remedy (repair, replacement, or refund) for items containing a defect in materials or workmanship. No warranty claim shall be honored unless received by DuPont within 90 d of the date the garment or accessory was shipped to the purchaser and/or end user or, within 12 mo from the date the encapsulated garment was shipped to the purchaser/end user. In no event shall DuPont be liable for any special, incidental, indirect, punitive or consequential damages, whether arising from contract, tort, warranty, representation, instruction, design or manufacturing defects, or any other cause or theory. Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user's responsibility to determine the level of risk and the proper protective equipment needed for the user's particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent right. Copyright © 2005 DuPont or its affiliates. All rights reserved. The DuPont Oval Logo, DuPont™, The Miracles of Science™, Tychem®, Nomex®, Kevlar®, Responder®, Reflector®, Mylar®, Lexan®, Teflon® and Thermobond® are registered trademarks or trademarks of DuPont or its affiliates. Barrier® is a registered trademark of Ansell Healthcare. Hazmax® is a registered trademark of Onguard Industries.

GENERAL

Tychem® TK, Front Entry Level A Garment, Certified to NFPA 1994 Class 1**Model:** TK612T**Stock:** TK612T (front entry)

DuPont Personal Protection
 5401 Jefferson Davis Highway
 Richmond, Virginia 23234
 Customer Service
 800-931-3456 (Tel)
 843-335-8599 (Fax)
 personalprotection@usa.dupont.com

Manufacturer Type: Domestic**Information Source:** <http://www.personalprotection.com>
Responder Knowledge Database (RKB)**Status:** The vendor has responded—6/6/2005**NFPA Certification:**

NFPA 1994 Class 1, 2001 Edition

OSHA EPA Level:

Level A

NFPA Certification Number:

CBT-DUP-03

Certifying Organization:

SEI

Date Certified/Expected:

September 27, 2005

Intertek—Annual reverifications

Required Boots:

Onguard Industries—Hazmax (87012) boots. Boot must be worn over the integrated bootie (sold separately).

Required Gloves:

Attached glove system:
 Inner barrier layer—Ansell Barrier, #2-100
 Middle glove—Guardian #IN-35 Neoprene
 Outer glove—Ansell #K2300-12 Kevlar®

Respiratory Equipment: SCBA is required and must be certified as compliant to NFPA 1981 (sold separately)

Air-Pak® Fifty™ 2.2 SCBA
 AirBoss Evolution Plus CBRN SCBA 2216 psig
 AirBoss Evolution Plus CBRN SCBA 4500 psig
 AirBoss PSS100 CBRN SCBA 4500 psig
 AirBoss PSS100 Plus CBRN 2216 psig
 BlackHawk™ Tactical Air Mask
 Firehawk SCBA 2216 psig
 Firehawk SCBA 4500 psig
 Viking SCBA
 Viking ST SCBA

Unit Cost: \$813**Availability:** In stock. If not in stock, standard lead time is 4 wk to 6 wk.**References:** Used by numerous Hazmat teams and Federal First Responders**Other Certifications:** Certified to NFPA 1991**Independent Testing:** Not applicable**Material Technology:** The NFPA 1994 Class 1 certified Tychem® TK ensemble provides an extremely durable material and boasts one of the broadest ranges of chemical protection available, successfully tested against more than 260 chemicals with no observed permeation after 8 h of continuous contact.

Tychem® TK—a patented limited-use fabric consisting of multiple nonpermeable barrier films laminated to both sides of a tough substrate material. Seams are sewn and sealed with hot air welded tape. The gloves are attached to the sleeve by an inverted, rigid ring and clamp system. The garment has an attached sock with boot-top covers. A user-supplied boot must be worn over the attached sock with the boot-top covers pulled down over the upper portion of the boot to prevent liquid pooling inside the boot. Permeation and Physical Property Data are available online at: www.personalprotection.dupont.com, or you can request a copy from customer service at 800-931-3456.

Design/Configuration: Suit is adjustable to accommodate various body types. Front entry.

- Ensemble Design and Description:**
1. The front entry suit shall be constructed from a multiple-layer, film-based composite material.
 2. The material, seams, visor, and gloves shall demonstrate no measurable chemical permeation for a period of 1 h when tested dimethyl sulfate, lewisite, mustard, sarin, VX, ammonia, chlorine, cyanogen chloride, carbonyl chloride, and hydrogen cyanide. In addition to the NFPA test data, the manufacturer shall be able to provide chemical permeation data results against the base fabric for more than 280 chemicals.
 3. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.
 4. The suit shall be constructed with an airtight zipper. The zipper shall be covered by a double overlapping storm flap made of the base fabric.
 5. The glove system shall consist of: a Neoprene Ansell Barrier® inner glove, a Guardian #IN-35 middle glove, and an Ansell Edmont #k2300-12 Kevlar® outer glove. The gloves shall be field replaceable by means of an internal ring and clamp system. The interface between the glove and sleeve shall form an airtight seal.
 6. The view window in the inner suit shall be a three layer face shield made of 40 mil polished PVC/5 mil Teflon® FEP/20 mil polished PVC.
 7. The garment shall have four pressure demand exhalation valves. The valves shall be covered by splash guards of the base material.
 8. The suit shall be constructed with sock boots made from the base material to allow the use of a replaceable overboot. The boot area shall be covered by a splash guard. (NOTE: An NFPA certified boot must be worn with the suit in order to meet NFPA certification.)
 9. The suit shall contain an internal waist belt system for support and improved fit.
 10. The suit shall be designed to accommodate a SCBA (self-contained breathing apparatus) and shall allow for the use of an ANSI certified hard hat.
 11. Each suit shall have a unique serial number. The suit shall be tested for airtight integrity prior to delivery. This test shall be conducted using positive air pressure as specified in ASTM F1052.
 12. The suit shall be capable of being field tested for airtight integrity using an optional positive pressure test kit (style No. 990810).
 13. The suit shall meet all the requirements set forth in NFPA 1994 Class 1 and shall be certified as such by SEI. The suit shall have proper labeling which states NFPA 1994 Certification and includes the SEI logo.
 14. In addition to the certification, current permeation data must be provided on all chemicals tested against the suit fabric.

Required Elements: Attached bootie worn with outer boot and attached gloves that are replaceable
Respiratory equipment—the ensemble has the ability to accommodate pass-through(s) for respirators
Number of pass-throughs—3

DuPont Tychem® TK pass-through options:

- ISI Pass-Through
- Draeger with Hansen Fitting Pass-Through
- Draeger with Foster Fitting Pass-Through
- Interspiro Pass-Through
- Scott with Hansen Fitting Pass-Through
- Scott with Schrader Fitting Pass-Through
- Survivair® with Foster Fitting Pass-Through
- Survivair® with Hansen Fitting Pass-Through
- Survivair® with Schrader Fitting Pass-Through
- MSA Dual Purpose with Foster Fitting Pass-Through
- MSA Dual Purpose with Hansen Fitting Pass-Through
- MSA with Schrader Fitting Pass-Through

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 1 and 1991 CB Option plus additional CA protection. Successfully tested against more than 260 chemicals.

BAs Protected Against: Exceeds NFPA 1994 liquid penetration and liquid biological threat protection

TIMs Protected Against: Meets 1994, 1991, and 1992 plus additional chemical threats

Rad/Nuc Materials Protected Against: Yes

Duration of Protection: Greater than or equal to 60 min and less than 119 min. Duration controlled by heat stress and respirator capability.

Acetone cyanohydrin—75-86-5—100 %—>480 min—<0.01—ASTM F 739

Acrolein—107-02-8—100 %—>480 min—<0.02—ASTM F 739

Acrylonitrile—107-13-1—100 %—>480 min—<0.001—ASTM F 739
 Allyl alcohol—107-18-6—100 %—>480 min—<0.1—ASTM F 739
 Ammonia—7664-41-7—100 % gas—>480 min—<0.1—ASTM F 739
 Arsine—7784-42-1—100 % gas—>480 min—<0.01—ASTM F 739
 Boron trichloride—10294-34-5—100 % gas—>480 min—<0.02—ASTM F 739
 Boron trifluoride—7637-07-02—100 % gas—>480 min—<0.1—ASTM F 739
 Carbon disulfide—75-15-0—100 %—>480 min—<0.02—ASTM F 739
 Carbon monoxide—630-08-0—100 % gas—330 min—0.1—ASTM F 739
 Chlorine—7782-50-5—100 % gas—>480 min—<0.02—ASTM F 739
 Chlorosulfonic acid—7790-94-5—100 %—>480 min—<0.1—ASTM F 739
 Diborane—19287-45-7—10 % (gas)—>480 min—<0.005—ASTM F 739
 Dimethylhydrazine—57-14-7—100 %—>480 min—<5.0—ASTM F 739
 Ethylene dibromide—106-93-4—100 %—>480 min—<0.1—ASTM F 739
 Ethylene oxide—75-21-8—100 % gas—>480 min—<0.1—ASTM F 739
 Fluorine—7782-41-4—100 % gas—>480 min—<0.002—ASTM F 739
 Formaldehyde (37 %)—50-00-0—100 %—>480 min—<0.09—ASTM F 739
 Hydrogen bromide—10035-10-6—100 % gas—>480 min—<0.1—ASTM F 739
 Hydrogen chloride—7647-01-0—100 % gas—>480 min—<0.1—ASTM F 739
 Hydrogen cyanide—74-90-8—100 % gas—>480 min—<0.01—ASTM F 739
 Hydrogen fluoride—7664-39-3—100 % gas—>480 min—<0.1—ASTM F 739
 Hydrogen selenide—7783-07-5—100 % gas—>480 min—<0.01—ASTM F 739
 Hydrogen sulfide—7783-06-4—100 % gas—>480 min—<0.01—ASTM F 739
 Methanesulfonyl chloride—124-63-0—100 %—>480 min—<0.0006—ASTM F 739
 Methyl chloroformate—79-22-1—100 %—>480 min—<0.01—ASTM F 739
 Methyl hydrazine—60-34-4—100 %—>480 min—<0.01—ASTM F 739
 Methyl isocyanate—624-83-9—100 %—>480 min—<0.013—ASTM F 739
 Methyl mercaptan—74-93-1—100 % gas—>480 min—<0.001—ASTM F 739
 Nitric acid, fuming—7697-37-2—100 %—>480 min—<0.033—ASTM F 739
 Phosgene—75-44-5—100 % gas—>480 min—<0.1—ASTM F 739
 Phosphine—7803-51-2—100 % gas—>480 min—<0.01—ASTM F 739
 Phosphorous trichloride—7719-12-2—100 %—>480 min—<0.1—ASTM F 739
 Sulfur dioxide—7449-09-05—100 % gas—>480 min—<0.01—ASTM F 739
 Sulfur trioxide—7449-11-9—100 %—90 min—696—ASTM F 739
 Sulfuric acid, concentrated—7664-93-9—95-98 %—>480 min—<0.1—ASTM F 739
 Sulfuryl chloride—7791-25-5—100 %—>480 min—<0.1—ASTM F 739
 Titanium tetrachloride—7550-45-0—100 %—>480 min—<0.1—ASTM F 739
 Tungsten hexafluoride—7783-83-6—100 % gas—>480 min—<0.026—ASTM F 739

Ensemble Application: IDLH environments or atmosphere with less than 19.5 % oxygen concentration is respirator dependent. Radiation protection against radioactive particles, not ionizing neutrons, gamma-rays, or x-ray radiation. Deep frozen media depends on additional thermal protection of hands. Biological.

Flame Resistance: No

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 6.6 kg (14.57 lb)

Ensemble weight (plus components): 9.35 kg (20.62 lb)*

*weight consists of suit with Ongaard Hazmax Boots, size 11, with no pass-throughs

Unit area weight of material used: 251 g/m² (10.6 oz/yd²)**

Material thickness of the ensemble: 660 μ (26 mil)**

**unit weight and thickness apply to garment material only

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted. Test subject was able to complete all tasks as specified in the standard.

Construction: The garment is constructed with double-taped seams to provide barrier against liquids, aerosols, and vapors, and increases durability. It has an extra wide three-layer face shield (PVC 40 mil/Teflon® 5 mil/PVC 20 mil), three-layer glove system (Neoprene/EVOH film/Kevlar® knit), expanded back (accommodates SCBA), front entry, gas-tight zipper closure, double storm flap over zipper, attached boots, outer boot flaps, knee wear pads, four exhaust valves, and internal adjustment belt. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.

Colors: High-visibility lime-yellow in color—Please contact customer service for special product applications

Dexterity: <600 %—based on results of NFPA certification test

Visual Acuity/Visibility: Field of view is limited to the respirator face-piece. The visor on the garment will not further reduce the field of vision. Visual acuity is better than or equal to 20/35.

FOV: Effective field of view greater than 70 % of natural field of view. Comments (i.e., size and shape of face shield)—extra wide face shield made of 3 layers: PVC 40 mil/Teflon® 5 mil/PVC 20 mil. The face shield consists of about 70 % of the hood, allowing almost peripheral viewing, even with an SCBA facemask on. Since the wearer can (and should) turn their head to view, the user has almost 180° of visibility. Anti-fog towelettes are included with ensemble to minimize fogging of the inner layer.

Don/Doff: Assistance is required for donning and doffing. 60 s—varies with practice, skill, and whether assistance is provided.

Operational Limitations: Users should use WBGT method for heat stress environmental modeling and a clothing correction factor of 10 °C (50 °F) for hooded coveralls and higher for encapsulated ensembles. Working in hot, humid environments depends on level of work activity, rest/work cycle, health of the individual, as well as temperature, humidity, wind speed, and radiant heating.

MCC Capability: Ensemble has the ability to be used with a microclimate cooling system. User must specify pass-throughs prior to garment manufacturing.

Environmental Conditions: Ensemble has met the cold temperature performance test. Glove has met independent cold temperature performance tests and exceeds standard's requirements.

LOGISTICS/TRAINING

TDP: Technical data package is included with all NFPA certified garments. For additional copies, please call customer service at 800-931-3456.

Training:

- **Training Hours:** Level of training on Tychem® garments depends on prior qualifications and training of end user. A HazMat technician requires less product-specific training than a novice user. Training documentation is available from the manufacturer.
- **Training Required:** Level of training on Tychem® garments depends on prior qualification and training of end-user. A HazMat technician requires less product specific training than a novice user.
- **Training Available:** Name of training course—Last Line of Defense. Training does not result in certification.
- **Manuals Available:** Technical data package and permeation guide available with each suit. User manuals are included with all NFPA certified suits and all Level A suits. For additional copies, please visit our website at: www.personalprotection.dupont.com, or call customer service at 800-931-3456.

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused. See user's manual.

Cleaning Products: Garments should be clean and dry before use. Water and mild, household dishwashing liquid should be used to clean these garments. These garments may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water, and air-dried. Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. Do not dry clean these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach.

Use/Reuse: Discard if contaminated. Disposal per jurisdictional regulations.

Shelf Life: 6 yr to 10 yr—DuPont™ suggests Tychem® chemical garments can be used as long as they pass a visual inspection test, and in the case of Level A garments, the ASTM F1052 inflation test. Tychem® chemical garments do not have a fixed shelf life. DuPont™ suggests retiring garments to “Training Use Only” 5 yr after date of receipt. See storage life statement at www.personalprotection.com.

Maintenance Required: All PPE should be inspected prior to each use, refer to 29 CFR 1910, Subpart I, Personal Protective Equipment Standards for General Industry. See the DuPont™ Personal Protection (DPP) user manual for specific instructions. (Extra copies are available online at www.personalprotection.dupont.com). Maintenance frequency is before and after each use and at least annually.

Maintenance Cost: Not specified

Storage Conditions: Temperature range: <49 °C (<120 °F). Relative humidity range: 0 % to 100 %.

Preferably, garments should be stored in a cool, dark, dry location, free of dirt and insects. Sunlight, ozone, high temperatures >49 °C (>120 °F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers. Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Consumables: Not applicable

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. 4X and 5X are available.

SPECIAL PARAMETERS

Health Hazards: If the garment has elastic wrists, ankles and/or an elastic hood opening, the elastic may contain natural rubber latex

Latex/Allergens: Garment contains latex; Garments are considered “articles” and are exempt from MSDS reporting requirements. The garments are nonhazardous.

Communications: Ensemble has the ability to interface with a communications system. There is a minimum order requirement for NFPA 1991 and 1994 Class 1 ensembles for certification of pass-through.

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: DuPont makes no guarantee of results and assumes no obligation or liability in connection with the use of DuPont garments and accessories. It is the user’s responsibility to determine the level of hazards and the proper personal protective equipment needed. DuPont warrants to the purchaser/end user only for a period of 90 d from date the garment or accessory was shipped to the purchaser/end user or, for a period of 12 mo from the date the encapsulated garment was shipped to the purchaser/end user that the garment and accessory, if any, are free of defects in materials and workmanship. Since conditions of use are outside DuPont’s control, DuPont makes no other warranties of any kind, expressed or implied, including, without limitation, no warranties of merchantability or fitness for a particular use and assumes no liability in connection with any use of the DuPont garment and accessories. This warranty is void in the event any party including purchaser/end user modifies the garment or accessory in any way. The sole and exclusive remedy for all purchasers and/or end users for any and all claims, losses, injuries or damages of any kind relating to or arising from DuPont garments and accessories, shall be the refund of the purchase price or the replacement or repair of any garment or accessory found to contain a defect in materials or workmanship upon inspection by DuPont. Only DuPont shall determine the form of remedy (repair, replacement, or refund) for items containing a defect in materials or workmanship. No warranty claim shall be honored unless received by DuPont within 90 d of the date the garment or accessory was shipped to the purchaser and/or end user or, within 12 mo from the date the encapsulated garment was shipped to the purchaser/end user. In no event shall DuPont be liable for any special, incidental, indirect, punitive or consequential damages, whether arising from contract, tort, warranty, representation, instruction, design or manufacturing defects, or any other cause or theory. Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user’s responsibility to determine the level of risk and the proper protective equipment needed for the user’s particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent right.

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GENERAL

Tychem® TK, Rear Entry Level A Garment, Certified to NFPA 1994 Class 1**Model:** TK613T**Stock:** TK613T (rear entry)

DuPont Personal Protection
 5401 Jefferson Davis Highway
 Richmond, Virginia 23234
 Customer Service
 800-931-3456 (Tel)
 843-335-8599 (Fax)
 personalprotection@usa.dupont.com

Manufacturer Type: Domestic
Information Source: <http://www.personalprotection.com>
 Responder Knowledge Database (RKB)
Status: The vendor has responded—6/14/2005

**NFPA Certification:**

NFPA 1994 Class 1, 2001 Edition

OSHA EPA Level:

Level A

NFPA Certification Number:

CBT-DUP-04

Certifying Organization:

SEI

Date Certified/Expected:September 27, 2005
Intertek—Annual reverifications**Required Boots:**

Onguard Industries—Hazmax (87012) boots. Boot must be worn over the integrated bootie (sold separately).

Required Gloves:

Attached glove system:
 Inner barrier layer—Ansell Barrier, #2-100
 Middle glove—Guardian #IN-35 Neoprene
 Outer glove—Ansell #K2300-12 Kevlar®

Respiratory Equipment: SCBA is required and must be certified as compliant to NFPA 1981 (sold separately)

Air-Pak® Fifty™ 2.2 SCBA
 AirBoss Evolution Plus CBRN SCBA 2216 psig
 AirBoss Evolution Plus CBRN SCBA 4500 psig
 AirBoss PSS100 CBRN SCBA 4500 psig
 AirBoss PSS100 Plus CBRN 2216 psig
 BlackHawk™ Tactical Air Mask
 Firehawk SCBA 2216 psig
 Firehawk SCBA 4500 psig
 Viking SCBA
 Viking ST SCBA

Unit Cost: \$813**Availability:** In stock. If not in stock, standard lead time is 4 wk to 6 wk.**References:** Used by numerous Hazmat teams and Federal First Responders**Other Certifications:** Not applicable**Independent Testing:** Not applicable

Material Technology: The NFPA 1994 Class 1 certified Tychem® TK ensemble provides an extremely durable material and boasts one of the broadest ranges of chemical protection available, successfully tested against more than 260 chemicals with no observed permeation after 8 h of continuous contact.

Tychem® Responder®—a patented fabric consisting of multiple barrier films laminated to both sides of a tough substrate material. Seams are sewn and sealed with hot air welded tape. The gloves are attached to the sleeve by an inverted, rigid ring and clamp system. The garment has an attached sock with boot-top covers. A user-supplied boot must be worn over the attached sock with the boot-top covers pulled down over the upper portion of the boot to prevent liquid pooling inside the boot. Permeation and Physical Property Data are available online at: www.personalprotection.dupont.com, or you can request a copy from customer service at 800-931-3456.

Design/Configuration: Suit is adjustable to accommodate various body types. Size-specific and rear entry.

- Ensemble Design and Description:** 1. The rear entry suit shall be constructed from a multiple-layer, film-based composite material.
2. The material, seams, visor, and gloves shall demonstrate no measurable chemical permeation for a period of 1 h when tested dimethyl sulfate, lewisite, mustard, sarin, VX, ammonia, chlorine, cyanogen chloride, carbonyl chloride, and hydrogen cyanide. In addition to the NFPA test data, the manufacturer shall be able to provide chemical permeation data results against the base fabric for more than 280 chemicals.
3. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.
4. The suit shall be constructed with an airtight zipper. The zipper shall be covered by a double overlapping storm flap made of the base fabric.
5. The glove system shall consist of: a Neoprene Ansell Barrier® inner glove, a Guardian #IN-35 middle glove, and an Ansell Edmont #k2300-12 Kevlar® outer glove. The gloves shall be field replaceable by means of an internal ring and clamp system. The interface between the glove and sleeve shall form an airtight seal.
6. The view window in the suit shall be made of 40 mil polished PVC and shall have an overlay of 5 mil FEP Teflon® permanently mounted over the visor.
7. The garment shall have three pressure demand exhalation valves. The valves shall be covered by splash guards of the base material.
8. The suit shall be constructed with sock boots made from the base material to allow the use of a replaceable overboot. The boot area shall be covered by a splash guard. (NOTE: An NFPA certified boot must be worn with the suit in order to meet NFPA certification.)
9. The suit shall contain an internal waist belt system for support and improved fit.
10. The suit shall be designed to accommodate a SCBA (self-contained breathing apparatus) and shall allow for the use of an ANSI certified hard hat.
11. Each suit shall have a unique serial number. The suit shall be tested for airtight integrity prior to delivery. This test shall be conducted using positive air pressure as specified in ASTM F1052.
12. The suit shall be capable of being field tested for airtight integrity using an optional positive pressure test kit (style No. 990810).
13. The suit shall meet all the requirements set forth in NFPA 1994 Class 1 and shall be certified as such by the SEI. The suit shall have proper labeling which states NFPA 1994 Certification and includes the SEI logo.
14. In addition to the certification, current permeation data must be provided on all chemicals tested against the suit fabric.

Required Elements: Attached bootie worn with outer boot and attached gloves that are replaceable
Respiratory equipment—the ensemble has the ability to accommodate pass-through(s) for respirators
Number of pass-throughs—3

DuPont Tychem® TK pass-through options:

- ISI Pass-Through
- Draeger with Hansen Fitting Pass-Through
- Draeger with Foster Fitting Pass-Through
- Interspiro Pass-Through
- Scott with Hansen Fitting Pass-Through
- Scott with Schrader Fitting Pass-Through
- Survivair® with Foster Fitting Pass-Through
- Survivair® with Hansen Fitting Pass-Through
- Survivair® with Schrader Fitting Pass-Through
- MSA Dual Purpose with Foster Fitting Pass-Through
- MSA Dual Purpose with Hansen Fitting Pass-Through
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OPERATIONAL

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BAs Protected Against: Exceeds NFPA 1994 liquid penetration and liquid biological threat protection

TIMs Protected Against: Meets 1994, 1991, and 1992 plus additional chemical threats

Rad/Nuc Materials Protected Against: Yes

Duration of Protection: Greater than or equal to 60 min and less than 119 min. Duration controlled by heat stress and respirator capability.

Acetone cyanohydrin—75-86-5—100 %—>480—<0.01—ASTM F 739

Acrolein—107-02-8—100 %—>480—<0.02—ASTM F 739

Acrylonitrile—107-13-1—100 %—>480 min—<0.001—ASTM F 739
 Allyl alcohol—107-18-6—100 %—>480 min—<0.1—ASTM F 739
 Ammonia—7664-41-7—100 % gas—>480 min—<0.1—ASTM F 739
 Arsine—7784-42-1—100 % gas—>480 min—<0.01—ASTM F 739
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 Carbon disulfide—75-15-0—100 %—>480 min—<0.02—ASTM F 739
 Carbon monoxide—630-08-0—100 % gas—330 min—0.1—ASTM F 739
 Chlorine—7782-50-5—100 % gas—>480 min—<0.02—ASTM F 739
 Chlorosulfonic acid—7790-94-5—100 %—>480 min—<0.1—ASTM F 739
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 Dimethylhydrazine—57-14-7—100 %—>480 min—<5.0—ASTM F 739
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 Formaldehyde (37 %)—50-00-0—100 %—>480 min—<0.09—ASTM F 739
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 Phosgene—75-44-5—100 % gas—>480 min—<0.1—ASTM F 739
 Phosphine—7803-51-2—100 % gas—>480 min—<0.01—ASTM F 739
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 Tungsten hexafluoride—7783-83-6—100 % gas—>480 min—<0.026—ASTM F 739

Ensemble Application: IDLH environments or atmosphere with less than 19.5 % oxygen concentration is respirator dependent. Radiation protection against radioactive particles, not ionizing neutrons, gamma-rays, or x-ray radiation. Deep frozen media depends on additional thermal protection of hands. Biological.

Flame Resistance: No

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 6.6 kg (14.57 lb)

Ensemble weight (plus components): 9.35 kg (20.62 lb)*

*weight consists of suit with Onguard Hazmax Boots, size 11, with no pass-throughs

Unit area weight of material used: 251 g/m² (10.6 oz/yd²)**

Material thickness of the ensemble: 660 μ (26 mil)**

**unit weight and thickness apply to garment material only

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted. Test subject was able to complete all tasks as specified in the standard.

Construction: The garment is constructed with double-taped seams to provide barrier against liquids, aerosols, and vapors, and increases durability. It has an extra wide three-layer face shield (PVC 40 mil/Teflon® 5 mil/PVC 20 mil), three-layer glove system (Neoprene/EVOH film/Kevlar® knit), expanded back (accommodates SCBA), front entry, gas-tight zipper closure, double storm flap over zipper, attached boots, outer boot flaps, knee wear pads, four exhaust valves, and internal adjustment belt. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.

Colors: High-visibility lime-yellow in color—Please contact customer service for special product applications

Dexterity: <600 %—based on results of NFPA certification test

Visual Acuity/Visibility: Field of view is limited to the respirator face-piece. The visor on the garment will not further reduce the field of vision. Visual acuity is better than or equal to 20/35.

FOV: Effective field of view greater than 70 % of natural field of view. Comments (i.e., size and shape of face shield)—extra wide face shield made of 3 layers: PVC 40 mil/Teflon® 5 mil/PVC 20 mil. The face shield consists of about 70 % of the hood, allowing almost peripheral viewing, even with an SCBA facemask on. Since the wearer can (and should) turn their head to view, the user has almost 180 ° of visibility. Anti-fog towelettes are included with ensemble to minimize fogging of the inner layer.

Don/Doff: Assistance is required for donning and doffing. 60 s—varies with practice, skill, and whether assistance is provided.

Operational Limitations: Users should use WBGT method for heat stress environmental modeling and a clothing correction factor of 10 °C (50 °F) for hooded coveralls and higher for encapsulated ensembles. Working in hot, humid environments depends on level of work activity, rest/work cycle, health of the individual, as well as temperature, humidity, wind speed, and radiant heating.

MCC Capability: Ensemble has the ability to be used with a microclimate cooling system. User must specify pass-throughs prior to garment manufacturing.

Environmental Conditions: Ensemble has met the cold temperature performance test. Glove has met independent cold temperature performance tests and exceeds standard's requirements.

LOGISTICS/TRAINING

TDP: Technical data package is included with all NFPA certified garments. For additional copies, please call customer service at 800-931-3456.

Training:

- **Training Hours:** Level of training on Tychem® garments depends on prior qualifications and training of end user. A HazMat technician requires less product-specific training than a novice user. Training documentation is available from the manufacturer.
- **Training Required:** Level of training on Tychem® garments depends on prior qualification and training of end-user. A HazMat technician requires less product specific training than a novice user.
- **Training Available:** Name of training course—Last Line of Defense. Training does not result in certification.
- **Manuals Available:** Technical data package and permeation guide available with each suit. User manuals are included with all NFPA certified suits and all Level A suits. For additional copies, please visit our website at: www.personalprotection.dupont.com, or call customer service at 800-931-3456.

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused. See user's manual.

Cleaning Products: Garments should be clean and dry before use. Water and mild, household dishwashing liquid should be used to clean these garments. These garments may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water, and air-dried. Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. Do not dry clean these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach.

Use/Reuse: Discard if contaminated. Disposal per jurisdictional regulations.

Shelf Life: 6 yr to 10 yr—DuPont™ suggests Tychem® chemical garments can be used as long as they pass a visual inspection test, and in the case of Level A garments, the ASTM F1052 inflation test. Tychem® chemical garments do not have a fixed shelf life. DuPont™ suggests retiring garments to “Training Use Only” 5 yr after date of receipt. See storage life statement at www.personalprotection.com.

Maintenance Required: All PPE should be inspected prior to each use, refer to 29 CFR 1910, Subpart I, Personal Protective Equipment Standards for General Industry. See the DuPont™ Personal Protection (DPP) user manual for specific instructions. (Extra copies are available online at www.personalprotection.dupont.com). Maintenance frequency is before and after each use and at least annually.

Maintenance Cost: Not specified

Storage Conditions: Temperature range: <49 °C (<120 °F). Relative humidity range: 0 % to 100 %. Preferably, garments should be stored in a cool, dark, dry location, free of dirt and insects. Sunlight, ozone, high temperatures >49 °C (>120 °F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers. Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Consumables: Not applicable

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. 4X and 5X are available.

SPECIAL PARAMETERS

Health Hazards: If the garment has elastic wrists, ankles and/or an elastic hood opening, the elastic may contain natural rubber latex

Latex/Allergens: Garment contains latex; Garments are considered “articles” and are exempt from MSDS reporting requirements. The garments are nonhazardous.

Communications: Ensemble has the ability to interface with a communications system. There is a minimum order requirement for NFPA 1991 and 1994 Class 1 ensembles for certification of pass-through.

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: DuPont makes no guarantee of results and assumes no obligation or liability in connection with the use of DuPont garments and accessories. It is the user’s responsibility to determine the level of hazards and the proper personal protective equipment needed. DuPont warrants to the purchaser/end user only for a period of 90 d from date the garment or accessory was shipped to the purchaser/end user or, for a period of 12 mo from the date the encapsulated garment was shipped to the purchaser/end user that the garment and accessory, if any, are free of defects in materials and workmanship. Since conditions of use are outside DuPont’s control, DuPont makes no other warranties of any kind, expressed or implied, including, without limitation, no warranties of merchantability or fitness for a particular use and assumes no liability in connection with any use of the DuPont garment and accessories. This warranty is void in the event any party including purchaser/end user modifies the garment or accessory in any way. The sole and exclusive remedy for all purchasers and/or end users for any and all claims, losses, injuries or damages of any kind relating to or arising from DuPont garments and accessories, shall be the refund of the purchase price or the replacement or repair of any garment or accessory found to contain a defect in materials or workmanship upon inspection by DuPont. Only DuPont shall determine the form of remedy (repair, replacement, or refund) for items containing a defect in materials or workmanship. No warranty claim shall be honored unless received by DuPont within 90 d of the date the garment or accessory was shipped to the purchaser and/or end user or, within 12 mo from the date the encapsulated garment was shipped to the purchaser/end user. In no event shall DuPont be liable for any special, incidental, indirect, punitive or consequential damages, whether arising from contract, tort, warranty, representation, instruction, design or manufacturing defects, or any other cause or theory. Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user’s responsibility to determine the level of risk and the proper protective equipment needed for the user’s particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent right.

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GENERAL

Kappler Zytron™ 500 Z5HTN NFPA 1994 Class 1 Certified Ensemble

Model: Z5HTN CH

Stock: Z5HTN

Kappler, Inc.
115 Grimes Drive
PO Box 490
Guntersville, Alabama 35976
Adam Terrell, Military Product Manager
256-505-4005 (Tel)
800-600-4019 (Tel)
256-505-4151 (Fax)
jcarroll@kappler.com

Manufacturer Type: Domestic
Information Source: <http://www.kappler.com>
Responder Knowledge Database (RKB)
Status: The vendor has responded—5/13/2005

**NFPA Certification:**

NFPA 1994 Class 1, 2001 Edition

OSHA EPA Level:

Level A

NFPA Certification Number:

CBT-KPR-01

Certifying Organization:

SEI

Date Certified/Expected:

March 2, 2005

Required Boots:

Onguard Industries—Hazmax (87012) boots available from Kappler but not sold with suits

Required Gloves:

Outer glove: CP 25 size XL—Guardian Buyl Outer Glove
Inner glove: 2-100 size 11—Ansell Barrier Inner Glove
Sold attached to suits

Respiratory Equipment: Air-Pak® Fifty™ 2.2 SCBA

AirBoss Evolution Plus CBRN SCBA 2216 psig
AirBoss PSS100 CBRN SCBA 4500 psig
Firehawk SCBA 2216 psig
Firehawk SCBA 4500 psig
Interspiro Spiromatic S4: SCBA with PASS and buddy breathing, pivoting Waist
SCBA Panther
Viking ST SCBA

Unit Cost: \$995**Availability:** Available for sale into military and medical markets**References:** Not specified**Independent Testing:** See permeation guides

Material Technology: Multi-layer barrier film laminated to a durable polypropylene substrate. Greater physical strength and chemical hold-out protection when compared to other film products. Provides protection in situations where there is a potential for light to moderate chemical splash.

Design/Configuration: Ensemble is adjustable to accommodate various body types. Ensemble has internal 5.1 cm (2 in) waist belt for size adjustment. Front entry and size specific design.

Ensemble Design and Description: Total Encapsulating Level A (gas-tight) suit, front entry, expanded back, two covered exhaust valves, sock boots with flared splash guards. Expanded face shield of 40 mil PVC with 5 mil FEP overlay lens. Gloves: Inner Ansell Barrier glove attached with gas tight ring and clamp; outer butyl glove attached with easy change twist/lock system. Internal pocket, left front. Heat-sealed seams on both inside and outside. Expanded width face shield; internal front left chest pocket which is removable; flared design storm flaps over boots for ease of donning/doffing; heavy-duty, extra-large size canvass reusable storage/carry bag in olive green.

Required Elements: Respiratory equipment, attached gloves that are replaceable, attached bootie worn with outer boot, and appropriate respiratory equipment

NFPA 1994 2001 edition certified SCBA respirators; no pass-throughs certified at this time

OPERATIONAL

CAs Protected Against: HD, GB, L, and VX required per NFPA 1994 Class 1 CA permeation resistance [100 g/m² (4.2 oz/yd²)]

BAs Protected Against: Exceeds NFPA 1994 by providing “systems level” aerosol threat protection

TIMs Protected Against: Meets NFPA 1994 Class 1 liquid/gases permeation resistance requirements

Rad/Nuc Materials Protected Against: Yes

Duration of Protection: 1 h based on NFPA Limits

Liquids:

Acetone—>480 min—ND—0.020

Acetone cyanohydrin—>480 min—ND; SDL 0.020—ASTM F739

Acetonitrile—50—ND—0.020

Carbon disulfide—>480 min—ND; SDL 0.050—ASTM F739

Dichloromethane—>480 min—28—0.050

Diethylamine—>480 min—ND—0.020

Dimethylformamide N,N—>480 min—ND—0.020

Ethyl acetate—>480 min—ND—0.020

Hexane—>480 min—ND—0.020

Methanol—>480 min—ND—0.020

Nitrobenzene—>480 min—ND—0.020

Sodium hydroxide 50 %—>480 min—ND—0.025

Sulfuric acid, concentrated—>480 min—ND, 0.025—ASTM F739

Tetrachloroethylene—>480 min—ND—0.020

Tetrahydrofuran—>480 min—ND—0.020

Toluene—>480 min—ND—0.020

Gases:

Ammonia—>480 min—ND—0.250

1, 3 Butadiene—>480 min—ND—0.020

Chlorine gas—>480 min—ND—0.100

Ethylene oxide gas—>480 min—ND—0.020

Hydrogen chloride gas—>480 min—ND—0.100

Methyl chloride gas—>480 min—ND—0.020

Ensemble Application: Chemical handling, hazardous materials/waste clean-up, HazMat teams, and decontamination

Flame Resistance: No

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 4.54 kg (10 lb) without boots

Ensemble weight (plus components): 6.8 kg (15 lb) with boots

Unit area weight of material used: 201 g/m² (8.5 oz/yd²)

Comfort ASTM: An ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted for the ensemble (evaluation is part of compliance requirements for NFPA 1991, 1992, and 1994)

Construction: Heat-sealed (taped)—A very strong, tight seam produced when a sewn seam is covered with a strip of material which is compatible with the material. The strip is either attached by traditional cement or strapping methods, or it is attached by heat-sealing or “heat taping” as with film-laminated fabrics.

Colors: Charcoal gray

Dexterity: Dexterity performance reduction is percent bare-handed control—145 % per NFPA 1994 Class 1 Testing

Visual Acuity/Visibility: Visual acuity better than or equal to 20/35

FOV: Visor is expanded shape/design, but there are no “field of view” tests results per NFPA 1994 Class 1

Don/Doff: Assistance needed for donning and/or doffing. Average donning time is less than 60 s.

Operational Limitations: This type of test information is not available; the temperature service range on the fabric has been identified and is available; however, safe working temperatures depend on a number of factors and have not been defined. There are uses and chemicals for which these garments are unsuitable. It is the responsibility of the user to review available data and verify that the garment is appropriate for the intended use and meets all specified government and industry standards.

MCC Capability: Ensemble has the ability to be used with a microclimate cooling system, to include appropriate certified pass-throughs

Environmental Conditions: Ensemble is compliant with NFPA 1994 Class 1 for cold temperature performance. The glove has met independent cold temperature performance tests.

LOGISTICS/TRAINING

TDP: A TDP is available from Kappler and packed with each suit

Training:

- **Training Hours:** Training not required but training documentation is available from the manufacturer
- **Training Required:** Training not required
- **Training Available:** User manual is packaged with each suit from the manufacturer
- **Manuals Available:** Use and Care Manual included with each ensemble

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused

Cleaning Products: Water and mild, household dishwashing liquid should be used to clean the suit. The suit may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water, and air-dried. Do not use any oxidative, corrosive or reactive decontamination solutions with this garment. Do not dry clean this suit. Do not use hot air or a tumbling air dryer to dry this suit.

Use/Reuse: If contaminated, ensemble cannot be cleaned and reused

Shelf Life: 6 yr to 10 yr—Under proper storage conditions, there is no evidence to indicate that the Zytron® film composite fabrics lose their protective characteristics or physical properties over time. This conclusion is based on the comparative testing of aged and new Zytron 600 fabric. Chemical suits contain components made from various polymer or rubber materials for which there is no specific shelf life data currently available. Based on the physical condition of the suit, it is recommended that downgrading suits to training use only be considered when they no longer pass the visual inspection and/or pressure test.

Maintenance Required: Suits should be stored in a cool dry area away from direct sunlight. Garments should have a visual test upon arrival from manufacturer, annually and/or after each use and a quick reinspection before each use.

Maintenance Cost: This data is not available

Storage Conditions: Temperature service range: -65 °C to 93 °C (-85 °F to 200 °F)

Recommended storage conditions: -18 °C to 38 °C (0 °F to 100 °F), out of direct sunlight

Relative humidity range: 100 %.

Consumables: Additional accessories that may be purchased include ChemTape, cooling vest, Onguard HAZMAX boots, and decontamination showers

Consumables Costs: Not specified

Package Shape/Size (Storage): Cube—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: Small, medium, large, X-large, 2X-large, 3X-large, and 4X-large

SPECIAL PARAMETERS

Health Hazards: Ensemble does not contain allergens

Latex/Allergens: Ensemble does not contain latex; MSDS is available

Communications: Pass through can be installed on request/special order

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: It is the responsibility of the user to select suits which are appropriate for each intended use and which meet all health standards. Kappler is available for consultation on any proposed use. Purchaser and all suit users shall promptly notify Kappler of any claim, whether based on contract, negligence, strict liability or otherwise. The sole and exclusive remedy of the purchaser and all users and the limit of liability of Kappler for any and all losses, injuries or damages resulting from use of a Kappler product shall be the refund of the purchase price or the replacement or repair of product found to be defective within 90 d after the product is delivered. In no event shall Kappler be liable for any special, incidental or consequential damages, whether in contract or in tort, arising out of any warranties, representations, instructions or defects from any cause in connection with the Kappler products, or the sale thereof. The purchaser and the users are deemed to have accepted the terms of this limitation of warranty and liability, which terms may not be varied by any verbal or written agreement. Purchaser and all users are responsible for inspection and proper care of this product as described in the manual and are responsible for all loss or damage from use or handling that results from conditions beyond the control of the manufacturer.

GENERAL

Lakeland Tychem TK NFPA 1994 Class 1 Ensemble**Model:** TK644, TK644W, TK654, TK654W

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 800-645-9291 (Tel)
 256-350-3011 (Fax)
 kendrab@lakeland-ind.com

Manufacturer Type: Domestic
Information Source: <http://www.lakeland.com>
 Responder Knowledge Database (RKB)
Status: The vendor has not responded 2/26/2004

**NFPA Certification:**

NFPA 1994 Class 1, 2001 Edition

OSHA EPA Level:

Level A

NFPA Certification Number:

MH28356

Certifying Organization:

UL

Date Certified/Expected:

July 29, 2003

Required Boots:

Onguard Industries—Hazmax boot (87012)

Required Gloves:North Viton-F101
Silver Shield-SSG**Respiratory Equipment:** Not specified**Unit Cost:** \$1.35K**Availability:** 4 wk to 5 wk lead time**References:** Not specified

Other Certifications: Consult DuPont Permeation Guide for certification and/or testing organizations. Nerve agent (GA, GB, GD, and VX) and blister agent (HD and L) testing.

Independent Testing: Consult DuPont Permeation Guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: 2-layer patented facepiece design with Teflon outer barrier protection

Design/Configuration: Internal structural support, adjustable suit (to accommodate various body types), rear entry, and pass-throughs

Ensemble Design and Description: Tychem TK rear-entry vapor-protective suit (Level A), expanded back, sealed seams inside and out, 48 in zipper, double storm-flap with Velcro, 2-layer face shield (10 mil Teflon outer, 40 mil PVC inner), 3-layer glove combination of North Silver Shield (inner), Viton (middle), and Kevlar (outer), 3 exhaust valves, attached sock boots with boot flaps, and 1.5 in waist belt with 3 belt loops sewn (inside) and sealed. Must be worn with NFPA certified boots.

Required Elements: Boots, gloves, and respirator

OPERATIONAL

CAs Protected Against: Equal to NFPA 1994 Class 1 CA permeation resistance [100 g/m² (4.2 oz/yd²)]

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats)

TIMs Protected Against: Meets NFPA 1994 Class 1 liquid/gases permeation resistance requirements

Rad/Nuc Materials Protected Against: Yes

Duration of Protection: 8 h

ASTM F739 permeation testing conducted by DuPont on almost 300 chemicals

Ensemble Application: Tactical operations, HAZMAT teams, chemical/biological testing, training, and warfare environments

Flame Resistance: No

HUMAN FACTORS

Ensemble Weight: 8 lb

2-layer face shield (10 mil Teflon outer, 40 mil PVC inner)

Comfort ASTM: Performance/wear testing conducted under NFPA 1994

Construction: Heat-sealed seams inside and out, gas tight zipper, double storm flap with Velcro closure, 2-layer face shield (10 mil Teflon outer, 40 mil PVC inner), 3-layer glove combination (Silver Shield-inner, Viton-middle, Kevlar-outer), 3 exhaust valves with splash guards, and sock boots with boots flaps.

Colors: Yellow

Dexterity: Dexterity performance reduction—200 %

Visual Acuity/Visibility: Visual acuity better than or equal to 20/35

FOV: At least 75 %. Garments are available with extra wide face shield.

Don/Doff: Not specified

Operational Limitations: The maximum time a garment can be worn depends on such variables as the air supply, ambient condition, climate inside the ensemble, physical and psychological condition of the wearer, work rate and work load. The Tychem TK fabric has a temperature service range of -70 °C (-94 °F) to 90 °C (194 °F).

MCC Capability: Not specified

Environmental Conditions: Not specified

LOGISTICS/TRAINING

TDP: Technical data package is available. User and instruction manuals are included in shipment and available on line.

Training:

- **Training Hours:** 1 h not provided by the manufacturer
- **Training Required:** Less than 8 h
- **Training Available:** Manual and CD available
- **Manuals Available:** Instruction manual

Cleanability: Cannot be cleaned

Cleaning Products: Not applicable

Use/Reuse: Not applicable

Shelf Life: 5 yr

Maintenance Required: Annual inspection recommended

Store from 16 °C to 29 °C (60 °F to 85 °F)

Relative Humidity: <78%

Store suit flat with zipper open

Maintenance Cost: Not specified

Storage Conditions: Temperature: 16 °C to 29 °C (60 °F to 85 °F). Relative humidity: <78 %. Suit should be stored flat with zipper open.

Consumables: Not specified

Consumables Costs: None

Package Shape/Size (Storage): —Less than or equal to 0.057 m³ (2.0 ft³)

Sizes Available: More than seven (7) sizes available (small to 7X-large)

SPECIAL PARAMETERS

Health Hazards: Ensemble contains latex

Latex/Allergens: Elastic may contain latex; Not specified

Communications: Ensemble has the ability to interface with a communications system

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (protective bomb suit) protective system

Warranty: 90 d warranty

GENERAL

STEPO (Self Contained Toxic Environment Protective Outfit)**Model:** 8415-01-454-XXXX**Stock:** Small (8415-01-452-6772), Medium (8415-01-452-8631), Large (8415-01-454-1627), X-Large (8415-01-452-8629)

Saint-Gobain Performance Plastics ChemFab
 701 Daniel Webster Highway
 Merrimack, New Hampshire 03054
 Dave Clark
 603-424-9000 (Tel)
 603-424-9012 (Fax)
 robert.t.currier@saint-gobain.com



Manufacturer Type: Domestic
Information Source: Saint-Gobain Performance Plastics, IMMC (RI), and ECBC (RI)
 Responder Knowledge Database (RKB)
 NIJ Guide for Personal Protection Equipment for Emergency First Responders, April 2001
Status: The vendor has not responded 2/26/2004

NFPA Certification:

NFPA 1994 Class 1 (no longer certified nor manufactured)

OSHA EPA Level:

Level A

NFPA Certification Number:

CBT-SGP-01

Certifying Organization:

SEI

Date Certified/Expected:

January 4, 2005

Required Boots:

Onguard Industries—Hazmax boot (87012)

Required Gloves:

Outer—Ansell Gold Knit Kevlar® p/n 70-225; North
 Neoprene/Butyl Glove BN1243
 Inner barrier layer—North Silver Shield® 4H®

Respiratory Equipment: Interspiro Spiromatic with Interspiro CW Kit

Face mask NSN 4240-01-464-1952

60 min high-pressure carbon fiber air cylinder

T-Fitting with suit/airline hose

Pass-throughs included for PICS, CASS, and tether mode

Unit Cost: Contact Ensemble Integrator, Rock Island Arsenal**Availability:** Equipment has been issued to Army EOD units, technical escort units, and chemical storage sites**References:** U.S. Army Explosive Ordnance Disposal (EOD) Units—Over 60 user locations fielded world wide
 Chemical Storage Depots/Activities, Technical Escort Units, Desert Storm, and Iraq Freedom**Other Certifications:** STEPO: NFPA 1991 Standard, 2000 Edition, SEI Ref. No. VPS SGP 01

NFPA 1994 Standard, 2001 Edition, SEI Ref. No. CBT SGP 01

Independent Testing: Agent testing contracted by: U.S. Army Natick Research (Natick, Massachusetts) and U.S. Army Test and Evaluation Command (Aberdeen Proving Ground, Maryland), and tested at U.S. Army Dugway Proving Ground (Dugway, Utah). Note: STEPO suit worn 5 times before testing prior to testing. STEPO passed NFPA 1991 tests.**Material Technology:** Suit is composed of multi-laminate material consisting of layers of fluoropolymer film and nonwoven Kevlar/Nomex blend. Visor assembly consists of primary FEP film with a secondary PVC overlay (replaceable). Glove system consists of a Neoprene/butyl outer glove and silver shield inner glove.**Design/Configuration:** Front entry**Ensemble Design and Description:** STEPO is a fully encapsulated, self-contained, Level A NFPA 1994 Class 1 certified (SEI Ref, No. CBT SGP 01) protective ensemble for protection against CB agents, flash fire, TICs, TIMs, POLs, rocket and missile hypergolic fuels, solvents, and other industrial chemicals. The ensemble incorporates two NIOSH approved SCBA (closed circuit rebreather or open circuit SCBA with tether air line option), a battery powered cooling system, and hands-free communication system.**Required Elements:** SCBA—NSN 4240-01-333-3495; tether mode equipment—NSN 8120-01-469-7861

OPERATIONAL

CAs Protected Against: NFPA 1992, 2005 Edition. Pass NFPA 1991 for sarin (GB), persistent nerve agent (VX), distilled mustard (HD), lewisite (L), and decontaminant (DS2). Data, method and protocol outlined in “System Evaluation Report for Self-Contained Toxic Environment Protective Outfit (STEPO)”, Report # DT-0416.

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats). Type classified by U.S. Army 1997; EPA and Army regulations, safety precautions are identified in TM 10-8415-231-12 and P. TECOM Project Number is D8-EI-825-STE-002.

TIMs Protected Against: Meets NFPA 1994 Class 1 liquid/gases permeation requirements. In addition the STEP ensemble will protect against diesel fuel, kerosene, JP-4, JP-8, and Decontaminant DS@. The suit material has been tested successfully to chlorine trifluoride, dimethylhydrazine, hydrazine, hydrogen fluoride, methylhydrazine, nitrogen dioxide, and phosgene per ASTM F739. Reference: Type classified by U.S. Army 1997; EPA and Army regulations, safety precautions are identified in TM 10-8415-231-12 and P; TECOM Project Number D8-EI-825-STE-002.

Duration of Protection: One (1) h with approved SCBA. Four (4) h of uninterrupted breathing with rebreather (NSN 4240-01-449-1526).

STEPO provides 4 h of respiratory protection against all CB agents

Ensemble Application: Explosive ordnance disposal (EOD), technical escort units, ammunition handlers, chemical surety activity, and IDLH environments

Flame Resistance: Yes

HUMAN FACTORS

Ensemble Weight: 5.5 kg to 6 kg (12.2 lb to 13.2 lb) depending on options

Unit area weight of material used (Challenge Ultrapro Vapor): 344 g/m² (14.5 oz/ydm²); material thickness: 22 mil

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted

Construction: Welded seams

Colors: Gray (suit); black (gloves). Color coding is available, no minimum order required.

Dexterity: Glove dexterity performance reduction meets requirements per ASTM F 2010 test method

Visual Acuity/Visibility: Suit provides from minimum 180° peripheral vision. Visual acuity is better than or equal to 20/35

FOV: 180° field of view

Don/Doff: One assistant is required to perform some aspects of donning and doffing. Suit can be donned or doffed in under 10 min.

Operational Limitations: Approved for use from -29 °C to 52°C (-20 °F to 125 °F). Local SOP will determine any other restrictions. Fully compatible with U.S Army Personnel Ice Cooling System (PICS).

MCC Capability: Personal Ice Cooling System (PICS) pass-through is provided with the suit

Environmental Conditions: Suit is designed for use in all common outdoor weather conditions and climate including rain, snow, extreme temperatures (as defined above) and humidity

LOGISTICS/TRAINING

TDP: Not specified

Training:

- **Training Hours:** Less than 8 h provided by the manufacturer. Minimum of 8 h training required for operation and an additional 8 h for maintenance.
- **Training Required:** Minimum of 8 h for operation. Additional 8 h for maintenance.
- **Training Available:** Yes, from IMMC
- **Manuals Available:** User manuals available and supplied with the suit

Cleanability: Follow local or military SOP. For vapor use 10 % calcium hypochlorite mixture by following recommended procedures for spraying with bleach, rinsing, and applying the HTH solutions.

Cleaning Products: Soap and water (nonphosphate detergent liquid soap)

Use/Reuse: STEPO is capable of being decontaminated for reuse after five vapor and liquid agent exposures and decontamination cycles. Discard any valves, closures, and gloves and replace after decon.

Shelf Life: 11 yr to 15 yr prior to required inspection and testing

Maintenance Required: Cleaning/sanitizing, visual inspection, zipper lubrication, and pressure test. Visual Inspection and pressure test, IAW TM 10-8415-231-12 and P. Frequency and allocations are as defined in the maintenance allocation chart in TM 10-8415-231-12 and P.

Maintenance Cost: Cost of labor

Storage Conditions: Temperature: -29 °C to 52 °C (-20 °F to 125 °F). Relative humidity: ambient at temperature. Keep dry.

Consumables: Inner gloves (Silver Shield), outer gloves (Neoprene/Butyl), O-rings, paraffin wax to lubricate zipper, Neoprene socks, repair kit, and TM specific consumables

Consumables Costs: Not specified

Package Shape/Size (Storage): Irregular—Garment: 61 cm x 61 cm x 30.5 cm (24 in x 24 in x 12 in)

Sizes Available: STEPO is available in four sizes

Small suit, medium suit, large suit, and X-large suit

SPECIAL PARAMETERS

Health Hazards: MSDS sheet available for suit material. The patching procedure is a heat-sealing process that may create fumes. Patching should be done in a ventilated area.

Latex/Allergens: Totally inert; MSDS sheet available for suit material. Call or email for MSDS.

Communications: Compatible with radio systems utilizing ear microphone/speakers, throat microphones, and other microphones and speakers that integrate with respirator protective facemasks.

EOD Compatibility: Suit and ensemble were specifically designed for EOD units and toxic munitions handlers

Warranty: 1 yr from receipt by IMMC

GENERAL

Trellechem® VPS/VP1**Model:** VPS/VP1**Stock:** Small (476520030), Medium (476520031), Large (476520032), X-Large (476520033) and XX-Large (476520034)

Trelleborg Viking, Inc.
170 West Road, Suite 1
Portsmouth, New Hampshire 03801
Tim Flaherty
Chuck Cooper
800-344-4458 (Tel)
603-436-1236 (Tel)
603-436-1392 (Fax)
tvi.usa@trelleborg.com

**Manufacturer Type:** Foreign—Trelleborg Industries, Ystad Sweden**Information Source:** <http://www.trelleborg.com/protective/>
NIJ Guide for Personal Protection Equipment for Emergency First Responders, April 2001

Responder Knowledge Database (RKB)

Status: The vendor has responded—1/11/2006**NFPA Certification:**

NFPA 1994 Class 1, 2001 Edition; NFPA 1991, 2005 Edition

OSHA EPA Level:

Level A

NFPA Certification Number:VPS-TRE-12, July 30, 2004
VPS-TRE-10, December 9, 2004**Certifying Organization:**

SEI

Date Certified/Expected:

August 2005

Required Boots:

Onguard Industries—Hazmax boot (87012) sold separately

Required Gloves:

Over glove—Kevlar® glove (KV18AJTC)—Perfect Fit Glove Company
Outer glove—Chloroprene rubber glove, 35A (072-251-000)—Guardian Manufacturing
Inner barrier layer—Silver Shield® 4H® (072-251-100)—North Safety Products

Respiratory Equipment: SCBA is required. The Trellechem® VPS VP1 is designed to accommodate all major SCBA brands.**Unit Cost:** \$2.3K**Availability:** Stocked item—30 d or less lead time. Off the shelf at the manufacturers U.S. distribution point, Portsmouth, New Hampshire.**References:** U.S. Military and police and fire departments worldwide**Other Certifications:** Force Institute Copenhagen, Denmark—EN943 Part 1 and 2. Test date 2005.

NFPA 1991/2000 Ed (USA), NFPA 1994/2005 Edition

NFPA 1991/2000 Edition Chemical/Biological Agent Option

EN943—European

Independent Testing: TNO Netherlands CAs (GB, GD, HD, GA, VX, L, AS, and CG). Test date 2003.**Material Technology:** Gas and liquid tight fabric construction. Strong and flexible polyamide fabric coated on the outside with chloroprene rubber and inside coated with chloroprene rubber and a barrier film laminate.**Design/Configuration:** Point of entry—front or rear entry design. Internal structural support—fabric substrate. Pass-through options. Ensemble is size specific and conforms to the body. Attached gloves (replaceable) are multi-layer (inner barrier, outer rubber, and Kevlar over). Integrated socks/booties; alternatively, the suit is supplied with fixed safety boots. Integrated possibility for ventilation. Standard flow rate approximately 2 alt. 30 L/min (optional approximately 30 alt. 100 L/min). Over pressure automatically controlled by means of membrane valves protected by separate splash protections.**Ensemble Design and Description:** Ensemble is designed by a tailor for comfort and fit. Front entry chloroprene rubber/polymer barrier fabric/laminate vapor protective fully encapsulated ensemble with exhaust valves. Type TE is a totally encapsulating/Level A design where the breathing apparatus is worn inside the suit and fully certified to the NFPA 1991 as well

as to the European standard EN 943. Type T is a nonencapsulating design where the breathing apparatus is worn outside the suit. Trellechem VPS type TE model VP1 provides protection against hazardous chemicals in liquid, vapor, gaseous, and/or solid form. Trellechem® VPS types T and TE are CE marked and fulfill EN 943 parts 1 and 2 (Emergency Teams). Ensemble has integrated socks/booties in the garment material. Also, a pair of silicone-coated oversocks is supplied with the suit. The standard glove assembly consists of two layers. A pair of separate thin inner comfort gloves of cotton is supplied with the suit. The suit can be delivered with a semi-fixed attached Viton/butyl rubber gloves in combination with wrist cuffs for increased safety. Visor is extra large, made from impact resistant 2 mm PVC. Downward closing zipper is long, heavy-duty, and gas-tight on the front left side for easy donning and doffing. Ensemble is equipped with an integrated possibility for ventilation.

Required Elements: Integrated socks/booties. Alternatively, the suit is supplied with fixed safety boots.

Inner glove made of a silver colored barrier film laminate. Fixed by a “snap-on” arrangement for easy replacement. Outer glove made of a flame retardant chloroprene rubber. Semi-attached to the suit by an elastic band. A pair of separate thin inner comfort gloves of cotton is always supplied with the suit.

Rubber face sealing anatomically designed for optimum safety and comfort (type T suits). High-impact resistant 2 mm special PVC visor (type TE suits).

Certified pass-throughs (Interspiro, MSA, ISI, Dräger, Scott, and Survivair).

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991, 2005 Ed., plus additional CA products. Level A or NFPA Class 1 Chem/Bio Certified 1991.

HD >24 h breakthrough

L >24 h breakthrough

GA >24 h breakthrough

GB >24 h breakthrough

GD >24 h breakthrough

VX >24 h breakthrough

AS >8 h breakthrough

CG >8 h breakthrough

CK >1 h breakthrough

BAs Protected Against: Exceeds NFPA 1994 by providing “systems level” aerosol threat protection. NFPA 1991 (2000 Edition) and Chem/Bio Option.

TIMs Protected Against: Meets 1994, 1991, and 1992 plus additional chemical threats

Rad/Nuc Materials Protected Against: Yes

Duration of Protection: Recommend 1 h, but suit material provides 8 h

Breakthrough time of most chemicals is >480 min, with few exceptions

Ensemble Application: All Level A, in Zones 1 and 2. Fused munitions, IDLH environments or atmosphere with less than 19.5 % oxygen concentration, biological, and deep frozen media.

Flame Resistance: Material meets NFPA 1991 flame resistance requirements

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 4.8 kg (10.6 lb)

Ensemble weight (plus components): 7.39 kg (16.3 lb)

Unit area weight of material used: 650 g/m² (27 oz/yd²); 0.5 ml thickness of material

Comfort ASTM: An ASTM F 1154 qualitative evaluation has been conducted. It is NFPA 1991 compliant.

Construction: Seams can be sewn, taped, welded, and glued. Seams are stitched with an aramide thread. They are covered on the outside with a chloroprene rubber strip and on the inside with a welded-on barrier film laminate strip. There are 26 seams; seams estimate approximately 10 yd linear. Zipper: Long chloroprene rubber coated gas-tight zipper protected by an external splash protective flap.

Colors: Yellow—camouflage is not available

Dexterity: Dexterity performance reduction—206 %

Visual Acuity/Visibility: Visual acuity is 20/30. It is NFPA 1991 compliant.

FOV: FOV—80 %. Because visor is not fixed to head, the FOV can vary. Anti-fog lenses are available as an option.

Don/Doff: <60 s for assisted donning and/or doffing

Operational Limitations: -40 °C to 66 °C (-40 °F to 150 °F). Relative humidity—0 % to 100 %. Duration of operation limited by duration of air source. All suit ventilation systems are available.

MCC Capability: Ensemble has pass-throughs for microclimate cooling

Environmental Conditions: Ensemble has met the cold temperature performance test (Class 1 and 2: Cold Temperature Performance Test (ASTM D 747)
VPS/VP1—0.1463 in lb machine direction and 0.1430 in lb across

LOGISTICS/TRAINING

TDP: TDP comes with each suit

Training:

- **Training Hours:** Less than 8 h provided by the manufacturer. Training documentation is available from the manufacturer. Required training includes donning and doffing, maintenance, and testing and repair.
- **Training Required:** Donning and doffing, maintenance, and testing and repair
- **Training Available:** Classroom/Online—Upon request
- **Manual/CD/Video—Trelchem—Manual, CD, or video**
- **Training CD comes with each ensemble**
- **Manuals Available:** User instructions with each ensemble

Cleanability: Ensemble is multiple use. It can be cleaned multiple times with brush (with mild soap and water).

Cleaning Products: Water and additional commercial detergents

Use/Reuse: Ensemble can be decontaminated depending on the chemical contamination

Shelf Life: Ensemble has a 5 yr shelf life

Maintenance Required: Inspect and pressure test after each use and annually. Lubricate zipper and store in cool environment.

Maintenance costs are \$0—provided suit is not used.

Maintenance Cost: \$0—provided suit is not used

Storage Conditions: 4 °C to 27 °C (40 °F to 80 °F). Relative humidity—0 % to 90 %. Keep away from direct sunlight.

Consumables: 4H/Silver Shield gloves—\$10

Rubber gloves—\$70

Suit bags, hangers, gloves, test kits, repair kits, CDROM, and suit manual

Consumables Costs: 4H/Silver Shield gloves—\$10

Rubber glove—\$70

Package Shape/Size (Storage): Oblong—Less than or equal to 0.113 m³ (4.0 ft³)

79 cm x 48 cm x 36 cm (31 in x 19 in x 14 in)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large

SPECIAL PARAMETERS

Health Hazards: Ensemble does not contain allergens

Latex/Allergens: Ensemble does not contain latex; MSDS is not available

Communications: Ensemble has communication capability

EOD Compatibility: Depending on size, the ensemble has the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: 3 yr against manufacturer defects

GENERAL

DTAPS® Level B Non-Encapsulating Coverall Ensemble**Model:** 75-000 (complete ensemble)**Stock:** 10-310 (garment only)

GEOMET Technologies, LLC.
20251 Century Boulevard, Suite 300
Germantown, Maryland 20874-1192
Hoyt Hughes
301-428-9898 x 252 (Tel)
301-428-9482 (Fax)
hhughes@geomet.com

Manufacturer Type: Domestic**Information Source:** <http://www.nbcprotect.com>
www.dtaps.com

Responder Knowledge Database (RKB)

Status: The vendor has responded—6/30/2006**NFPA Certification:**

NFPA 1994 Class 2, 2001 Edition

OSHA EPA Level:

Level B

NFPA Certification Number:

CBT-GEO-01

Certifying Organization:

SEI

Date Certified/Expected:

April 2004

Required Boots:

Onguard HazMax® Kneeboot (Geomet p/n 40-100)

Required Gloves:

Inner glove—North Silver Shield®/4H® 2.7 mil (Geomet p/n 50-300)
Outer glove—JOMAC Kevlar® Plus outer glove (Geonet p/n 50-400)
Middle glove—North Safety Products neoprene/butyl glove (Geomet p/n 50-100)

Respiratory Equipment: SCBA is required and must be certified as compliant to NFPA 1981 (sold separately)**Unit Cost:** \$5.2K (coverall @ \$181; splash hood @ \$161; boots @ \$84; air inlet system @ \$488; Interspiro SCBA @ \$4.3K)**Availability:** Manufactured on demand with a 30 d lead time**References:** MARCORSSYSCOM/CBIRF—20 units—2 yr in use—Adam Becker (703-432-3210)**Other Certifications:** None**Independent Testing:** CA testing and TICs/TIMs permeation testing by independent accredited laboratories. Overall Ensemble Inward Leakage (SF6 test) protocol and the Liquid-Tight Integrity (ASTM F 1359 test) protocol.**Material Technology:** Ensemble is constructed of impermeable materials; garment incorporates a liquid-resistant front-entry zipper closure; gloves are mechanically attached to garment sleeve with a rigid plastic ring and O-ring system; bootie is integral to garment**Design/Configuration:** Donning/doffing time and assistance will be noted. Pass-through options. Gloves can be changed by the user to accommodate different hand sizes for a given suit size. Front entry and size specific design.**Ensemble Design and Description:** DTAPS® NFPA 1994 Class 2 System features a neck dam to minimize vapor intrusion and an air inlet to slightly over-pressurize the coverall. The coverall also has a liquid-resistant zipper with double splash flaps, integral booties with splash guards, and mechanically attached 24 mil neoprene/butyl outer gloves with Silver Shield®/4H® inner gloves. Ensemble is a fully integrated system; garment has integral booties, which provide complete vapor protection; mechanically attached gloves also provide complete vapor protection and are user replaceable; separate hood seals tightly to face mask to preclude vapor and liquid intrusion—no outer visor to fog or further reduce field of view.**Required Elements:** Attached bootie worn with outer boot (Onguard Hazmax)

Attached gloves, replaceable, multi-layer glove requirements (inner and outer gloves are mechanically attached to garment, but are user replaceable). Gloves can be changed by the user to accommodate different hand sizes for a given suit size.

Respiratory equipment—the ensemble has the ability to accommodate pass-through(s) for respirators

Number of pass-throughs—2 (cooling and communication equipment)

Ensemble is certified with Onguard Hazmax boots and Interspiro Spiromatic S-3 CBRN-approved SCBA

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 2 CA permeation resistance and limited vapor protection. Requirement (ensemble test)—Material tested against GA and GD (in addition to GB, HD, L, and VX); seams independently tested against GB.

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats)

TIMs Protected Against: Meets 1994, 1991/1992 ASTM F 1001 battery of 21 chemicals. Tychem LV permeation data is available for more than 250 chemicals. Please refer to DuPont's Permeation Guide for Tychem Fabrics and the DuPont Fax-on-Demand Data Service at 800-558-9329.

Duration of Protection: 45 min (limited by amount of air in SCBA cylinder). Tychem LV material provides >8 h of permeation resistance for most of the ASTM F 1001 chemicals, plus >8 h of permeation resistance for over 200 additional chemicals (as noted above)

Please refer to DuPont's Permeation Guide for Tychem Fabrics and the DuPont Fax-on-Demand Data Service at 800-558-9329.

Ensemble Application: The DTAPS® NFPA 1994 CLASS 2 SYSTEM was specifically designed for use in Domestic Preparedness, WMD, and CBRN environments. System provides protection against CB agents, as well as industrial chemicals. Explosive atmospheres, IDLH environments or atmosphere with less than 19.5 % oxygen concentration, and biological.

Flame Resistance: No

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 1.82 kg (4 lb)

Ensemble weight (plus components): 18.6 kg (41 lb)

Garment (with gloves) weight is 1.36 kg (3 lb); hood is 0.45 kg (1 lb); boots are 3.18 kg (7 lb), SCBA is approximately 13.6 kg (30 lb) (depending on amount of air in cylinder)

Unit area weight of material used: 142 g/m² (6.6 oz/yd²) (garment); 261g/m² (11 oz/yd²) (hood)

Material thickness of the ensemble: 533 μ (30 mil) (garment); 279 μ (11 mil) (hood)

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted for the ensemble. Passes requirements in NFPA 1994.

Construction: Sewn, taped, and heat-sealed, 9 seams total. Back seam—109 cm (43 in); arm seam—61 cm (24 in) (2 each); arm hole—56 cm (22 in) (2 each); leg—79 cm (31 in) (2 each); bootie/leg hole—41 cm (16 in) (2 each).

Colors: Only available in olive drab green

Dexterity: Less than 22 % dexterity performance reduction. Passes NFPA 1994, Class 2 requirement of less than 450 % increase over barehanded control.

Visual Acuity/Visibility: Visual acuity is better than or equal to 20/35

FOV: 90 % to 95 % (~170° field of view). Visor of SCBA facemask is used as the ensemble face shield [~11 cm (4.25 in) high by 22 cm (8.5 in) wide].

Don/Doff: Assistance is needed for donning and/or doffing. Average donning time is <10 min.

Operational Limitations: Not in temperatures above 49 °C (120 °F). Not in temperatures below -18 °C (0 °F) (material will stiffen).

MCC Capability: A pass-through is available for use with an optional personal ice cooling system

Environmental Conditions: Ensemble has met the cold temperature performance test. Glove has met independent cold temperature performance tests and exceeds the standard's requirements. Bending moment less than 0.5 in-lbf per NFPA 1994, Class 2.

LOGISTICS/TRAINING

TDP: Technical data package is available. Hard copy and/or electronic copy available upon request.

Training:

- **Training Hours:** <8 h provided by the manufacturer. 2 h training required for operation. Training documentation is available from the manufacturer.
- **Training Required:** 2 h for operation
- **Training Available:** Classroom Training—DTAPS Level B coverall ensemble training. Offsite and onsite training results in certification. Training available at additional cost upon request. Contact GEOMET for details.
- **Manuals Available:** User instruction manual included in box with garment

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused. It is a limited use garment but can be used as a training suit if not contaminated. Suit must be disposed of after any liquid or vapor chemical exposure.

Cleaning Products: Garment can be cleaned and reused as training suit only; hand wash with warm water and mild detergent, then rinse with clean water and hang to dry; treat with biocide after each training use. Disposal procedures are available. The recommended disposal method is to immerse the suit in household bleach (5 % solution) for 24 h. After 24 h, the suit should then be incinerated or landfilled in a secured, permitted hazardous waste landfill in accordance with all applicable Federal, state, and local laws and regulations.

Use/Reuse: Garment is limited use, but can be used as a training suit if not contaminated. Suit must be disposed of after any liquid or vapor chemical exposure.

Shelf Life: 1 yr to 5 yr

Maintenance Required: Before and after each use and annually

Maintenance Cost: None

Storage Conditions: Temperature: 10 °C to 24 °C (50 °F to 75 °F). Relative humidity: 50 % to 90 %. Store in a cool, dark, dry place free from insects and away from direct sunlight (ultraviolet light).

Consumables: None

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube [$>0.113 \text{ m}^3$ (4.0 ft^3)]

Ensemble box—41 cm x 51 cm x 24 cm (16 in x 20 in x 9.5 in) = 1.8 ft^3 (garment with gloves, hood, boots)

SCBA case—32 cm x 71 cm x 46 cm (12.5 in x 28 in x 18 in) = 3.7 ft^3

Garment box only—41 cm x 25 cm x 41 cm (16 in x 10 in x 16 in) = 1.5 ft^3 (2 per box)

Sizes Available: Small, medium, large, X-large, XX-large, and XXX-large. 2X-large and 3X-large available as special orders.

SPECIAL PARAMETERS

Health Hazards: Ensemble does not contain allergens

Latex/Allergens: Ensemble does not contain latex; MSDS available for garment material

Communications: Ensemble has the ability to interface with a communications system. DTAPS Level B suit is compatible with various commercial radio systems, such as the optional intrinsically-safe DWIS radio system.

EOD Compatibility: DTAPS suit can be worn under protective bomb suit

Warranty: Manufacturer warranty is 90 d after delivery of DTAPS® garment. GEOMET warranty covers defects in materials and workmanship in the garment when used in accordance with the instructions contained in the User's Instruction Manual.

GENERAL

Tactix MT-94™

Model: MT-94 LE, MT-94 FS

Stock: CMTM10 and CMTM20

Lion Apparel
6450 Poe Ave
Dayton, Ohio 45414
Tom Martin
877-410-6614 (Tel)
877-803-1032 (Fax)
tomm@lionapparel.com

Manufacturer Type: Domestic
Information Source: <http://www.lionrescuewear.bx>
Responder Knowledge Database (RKB)
Status: The vendor has responded—11/22/2005



NFPA Certification:

NFPA 1994 Class 2, 2001 Edition; NFPA 1992, 2005 Edition

OSHA EPA Level:

Level B

NFPA Certification Number:

CBT-LNS-01

Certifying Organization:

SEI

Date Certified/Expected:

October 17, 2005

Required Boots:

Lion Warhorse™ I and Warhorse™ II Rubber Boot

Required Gloves:

Inner barrier layer—G9492-C2 GORE™ CHEMPAK® Ultra Barrier
Outer glove—G9492-OGN JB1GU (Palm: sheep grain leather, Back: Nomex® knit)

Respiratory Equipment: MSA Millennium Full Facepiece APR 10051286, 10051287, 10051288 with canister p/n 10046570 (CBRN # TC-14G-0270)

Scott 2.2, 3.0, and 4.5 Air-Pak with AV3000™ CBRN Facepiece, sizes small, medium, large (CBRN NIOSH # TC-13F-76CBRN, -80CBRN, -96CBRN, -212CBRN, -366CBRN)

Unit Cost: \$1.9K (law enforcement version)

Availability: In stock

References: Not specified

Material Technology: Gore Chempak Ultra Barrier fabric is a thin, lightweight, and high-strength PTFE film with a tough Nomex outer shell. The MT94 employs Gore™ Chempak Ultra Barrier fabric, a thin, lightweight, and high-strength PTFE film with a tough Nomex® outer shell. When combined with the streamlined design of the MT94, it delivers outstanding protection and creates a significant reduction in weight and bulk. This provides a greater range of motion, increased mobility, and ease in donning and doffing.

Design/Configuration: Suit adjustable to accommodate bulky equipment, size specific and adjustable, and rear entry

Ensemble Design and Description: The Lion Apparel Tactix Brand® MT-94™ ensemble is a nonencapsulating coverall with hood and attached bootie, made of 9.4 oz GORE™ CHEMPAK® Ultra Barrier Fabric. The rear entry suit is adjustable to accommodate bulky equipment and interfaces with many commonly used CBRN breathing apparatus systems. Standard features on the tan fire and emergency services ensemble include a radio pocket on the left chest, roomy thigh pockets, hook and loop ID tabs, and yellow and silver 3M™ Scotchlite™ Reflective Material on the wrists, pants cuffs, and back. The MT94 is available in navy for law enforcement applications, and standard features include thigh pockets, hook and loop ID tabs, and hook and loop belt loops for duty belts.

Required Elements: Footwear—attached bootie worn with outer boot

Gloves—multi-layer glove requirements, i.e., Gore Chempak glove attached via removable system and outer leather/nomex glove; respiratory equipment; no certified pass-throughs

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 2 CA permeation resistance and limited vapor protection requirement (ensemble test). Protects against HD, L, GB, and VX.

BAAs Protected Against: Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats). Bloodborne pathogens.

TIMs Protected Against: Meets 1994, 1991, and 1992 plus limited vapor (ensemble test). Dimethyl sulfate, ammonia, chlorine, cyanogen chloride, carbonyl chloride, hydrogen cyanide, other various TICs and TIMs.

Duration of Protection: 40 min

All chemical testing done as per Fixperm X10, ASTM F739:

Ammonia—1000 ppm—>1440 min—<0.01 (permeation rate)

Chlorine—1000 ppm—>1440 min—<0.01 (permeation rate)

Hydrogen cyanide—1000 ppm—>480 min—<0.01 (permeation rate)

Ensemble Application: The MT94 was principally designed to offer a high level of vapor protection required to protect against selected chemical/biological terrorism agents. However, the MT94 has a wide range of uses, including technical rescue, Hazmat, confined space rescue, decon, high-risk entries (such as narcotics labs), and bomb (secondary threat protection). In addition to guarding against challenges identified in NFPA (National Fire Protection Association) 1994 and 1992 standards, the MT94 also offers protection against flame and “weaponized” CB agents. Can be used in IDLH environments or atmosphere with less than 19.5 % oxygen concentration, and for biological applications. NFPA 1994 Class 2 ensembles are intended for scenarios where the threat has been identified and the actual release has subsided. Exposure conditions could include contact with residual vapor or gas and highly contaminated surfaces at the emergency site. NFPA 1992 establishes requirements for chemical liquid splash protection where no chemical vapor hazards exist.

Flame Resistance: Garment portion of the ensemble is made using flame-resistant material (meeting NFPA 1991 requirements) Not recommended for flammable or flash fire environment

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 2.7 kg (6 lb)

Gore™ CHEMPAK® Ultra Barrier Fabric—unit area weight of material used: 222 g/m² (9.4 oz/yd²)

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted for the ensemble

Construction: Multi-thread garment; taped

Colors: Tan (fire service version) and navy (law enforcement version); color coding is not available

Dexterity: Not specified

Visual Acuity/Visibility: Not specified

FOV: Matches to SCBA facepiece

Don/Doff: Self donning, however needs assistance to close zipper and inspect seals. Average donning time is <60 s

Operational Limitations: Not available

MCC Capability: Ensemble does not have the ability to be used with a microclimate cooling system

Environmental Conditions: The ensemble has met the cold temperature performance test. The glove has met independent cold temperature performance tests.

LOGISTICS/TRAINING

TDP: Technical data package is available. User instruction manuals available and no charge.

Training:

- **Training Hours:** Less than 8 h not provided by the manufacturer
- **Training Required:** Less than 8 h
- **Training Available:** Training documentation is available from the manufacturer; results in certification
- **Manuals Available:** User instructions are included with the ensemble

Cleanability: If not contaminated, ensemble (exclusive of consumables) can be cleaned and reused. When needed, up to 5 wash cycles.

Cleaning Products: Not specified

Use/Reuse: Decontamination/disposal procedures are available

Shelf Life: 1 yr to 5 yr

Maintenance Required: Inspection only

Maintenance Cost: Not specified

Storage Conditions: Recommended storage conditions: 21 °C (70 °F). Relative humidity range: 40 %.

Consumables: No consumables

Consumables Costs: Not applicable

Package Shape/Size (Storage): Oblong—Less than or equal to 0.057 m³ (2 ft³)

Sizes Available: Small, medium, large, X-large, 2X-large, 3X-large, and 4X-large

SPECIAL PARAMETERS

Health Hazards: Not specified

Latex/Allergens: Ensemble does not contain latex; Not specified

Communications: Ensemble has the ability to interface with a communications system through SCBA manufacturer

EOD Compatibility: EOD chemical threat protection

Warranty: Not specified

GENERAL

ITAP (Improved Toxicological Agent Protective) Ensemble**Model:** NSN 8415-01-463-5829 (Large)**Stock:** Small (8415-01-463-7151); Medium (8415-01-463-7150); Large (8415-01-463-5829); X-Large (8415-01-463-5830); Splash Hood (8415-01-478-3518)

Saint-Gobain Performance Plastics ChemFab
 701 Daniel Webster Highway
 Merrimack, New Hampshire 03054
 Robert T. Currier, Saint-Gobain, Protective Systems
 603-424-9000 (Tel)
 603-424-9012 (Fax)
 robert.t.currier@saint-gobain.com

Manufacturer Type: Domestic**Information Source:** Saint-Gobain Performance Plastics, IMMC(RI), and ECBC (RI)
Responder Knowledge Database (RKB)**Status:** The vendor has not responded 2/26/2004**NFPA Certification:**

NFPA 1994 Class 2/Class 3, 2001 Edition; NFPA 1992, 2005 Edition

OSHA EPA Level:

Level B (SCBA); Level C (CASS-compact air supply system and facemask)

NFPA Certification Number:

CBT-SGP-02

LPS-SGP-01

LPS-SGP-01-01 (2000 Edition variant)

Certifying Organization:

SEI

Date Certified/Expected:

October 28, 2004

September 19, 2005 (revised)

Required Boots:

Pro Warrington Model 6000 Boot

Required Gloves:

Two configurations:

1) Outer—Ansell Gold Knit Kevlar® p/n 70-225; North Safety M3 TAP and inner barrier layer—North Silver Shield® 4H®

2) ONEGlove—Hazmat p/n 22402M, 22403M, 22404M, 22405M, 22406M, and 22407M,

Respiratory Equipment: Interspiro Spiromatic with Interspiro CW Kit

Face mask NSN 4240-01-464-1952

60 min high pressure carbon fiber air cylinder

T-Fitting with suit/airline hose

Pass-throughs included for PICS and CASS

Unit Cost: Contact Ensemble Integrator, Rock Island Arsenal**Availability:** In stock**References:** U.S. Military—IDLH environments, technical escorts, and routine depot operations**Independent Testing:** Toxic Industrial data available from manufacturer. CA data available from manufacturer and developer.**Material Technology:** Suit is composed of multi-laminate composite materials (challenge Ultrapro Vapor and Challenge Ultrapro Vapor and Challenge Ultrapro Splash consisting of layers of fluoropolymer film and nonwoven Kevlar/Nomex blends. Visor assembly consists of primary FEP film with a secondary PVC overlay (replaceable). Glove system consists of a neoprene/butyl outer glove and Silver Shield inner glove.**Design/Configuration:** Front entry**Ensemble Design and Description:** ITAP, 2-barrier and 3-barrier layer nonencapsulating ensemble with reusable chemical splash hood—Geomet p/n SH-100. ITAP has two modes of operation to provide different levels of protection based upon the chemical threat present. The first mode consists of SCBA with CW Kit, personal ice cooling system (PICS), and protective splash hood and overvest (OSHA Level B). The second mode consists of the Compact Air Supply System (CASS), M40A1 facemask, PICS, and protective suit (OSHA Level C). The suit is two-piece construction that is compatible with a variety of SCBAs (open and closed circuit), PICS, communications equipment, and a splash hood. The suit closure mechanism (zipper) and flap offers liquid Level B protection. Glove interface consists of a flexible glove cuff with dual O-ring seals for redundancy.

Open-faced design, conforming suit utilizing CBRNE, NIOSH approved SCBA, tested to (5) chemical attacks and decontaminations successfully.

Required Elements: Footwear, gloves, respiratory equipment, and other items required with this ensemble

Respirator and other pass-throughs certified for use with this ensemble: Interspiro Spiromatic with Interspiro CW Kit facemask

NSN 4240-01-464-1952

Spiromatic 9030 /S3 9030 SCBA

OPERATIONAL

CAs Protected Against: NFPA 1992, 2005 ed, equal to NFPA 1994 Class 1 CA permeation [100 g/m² (4.2 oz/yd²)]

Protects against all known CAs, including nerve agents GB (sarin) and VX; and blister agents HD (mustard) and L (lewisite).

Document J02023-01, updated 3-21-03, First Article Test Report. 3034911-001A, ITS, 3-17-2003.

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats). Protects against all known BAs. Document Jo2023-01 Updated 3-21-03 First Article Test Report. 3034911-001A, ITS-3-17-03.

TIMs Protected Against: Meets 1994, 1991/1992 ASTM F 1001 battery of 21 chemicals. The ITAP ensemble materials have been tested to and will protect against the standard 21 industrial chemicals listed in NFPA 1991. Document J02023-01 (updated 3-21-03), First Article Test Report 3034911-001A, ITS, and 3-17-2003.

Duration of Protection: The ITAP ensemble will provide 2 h level B or Level C protection for personnel during peacetime and wartime. The ITAP ensemble protects against a wide range of industrial chemicals including TICs, TIMs, POLs, and CAs.

Level B, NFPA 1994, Class 2 TICs, TIMs and CAs

Ensemble Application: Protective suits for all hazardous chemicals, biological and warfare agents. The ITAP ensemble will provide Level B and C protection for personnel during peacetime and wartime for short operations in Immediate Dangerous to Life or Health (non-ILDH) toxic chemical environments, emergency life saving response, Technical Escort Incident response, routine depot operations, and initial entry monitoring.

Flame Resistance: Garment portion of the ensemble is made using flame-resistant material

HUMAN FACTORS

Ensemble Weight: 5.44 kg (12 lb)

Unit area weight of material used (Challenge Ultrapro Vapor): 332 g/m² (14 oz/yd²)

Unit area weight of material used (Challenge Ultrapro® Splash): 249 g/m² (10.5 oz/yd²)

Unit area weight of material used (in oz/yd²): 21 oz

Material thickness (in mils): 22 mils

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted

Construction: Heat-sealed seams with heat-sealed over tape. No stitching required.

Colors: Light gray exterior with orange interior. Color coding is available with no minimum order requirements.

Dexterity: Meets requirements >600 %

Visual Acuity/Visibility: Suit is an open face design that interfaces to an approved CBRNE SCBA facemask. Visual acuity is better than or equal to 20/35 (through the suit visor or face shield).

FOV: Not specified

Don/Doff: One assistant is required to perform some aspects of donning and doffing. Suit can be donned or doffed in under 10 min.

Operational Limitations: Approved for use from -29 °C to 52°C (-20 °F to 125 °F). Local SOP will determine any other restrictions. Fully compatible with U.S Army Personnel Ice Cooling System (PICS).

MCC Capability: Personal Ice Cooling System (PICS) pass-through is provided with the suit

Environmental Conditions: Suit is designed for use in all common outdoor weather conditions and climate including rain, snow, extreme temperatures (as defined above), and humidity

LOGISTICS/TRAINING

TDP: TDP is available

Training:

- **Training Hours:** Recommended a minimum of 8 h following the IMMC Manual TM 10-8415-231-12 and P. Additional 8 h for maintenance.
- **Training Required:** Minimum 8 h of operation. Additional 8 h for maintenance.
- **Training Available:** Yes, from IMMC
- **Manuals Available:** Technical Manual TM 10-8415-231-12 and P. Manual supports operation and maintenance of the suit and ensemble.

Cleanability: May be cleaned and decontaminated per instructions

Cleaning Products: Decon agent and soap and water

Use/Reuse: Not specified

Shelf Life: 11 yr to 15 yr

Maintenance Required: Semi-annually. Maintenance costs about \$50.

Maintenance Cost: \$50

Storage Conditions: Temperature: -29 °C to 52 °C (-20 °F to 125 °F). Relative humidity: Ambient or below 80 %. Keep dry.

Consumables: Inner Gloves (Silver Shield), outer gloves (Neoprene/Butyl), O-Rings, Paraffin wax to lubricate zipper, Neoprene socks, repair kit, and TM specific consumables

Consumables Costs: Not specified

Package Shape/Size (Storage): Cube—50 cm x 39 cm x 30.5 cm (19.5 in x 15.5 in x 12 in)

Sizes Available: Small, medium, large, and X-large

SPECIAL PARAMETERS

Health Hazards: MSDS sheet is available for suit material. Patching/repairing the suit material is a heat sealing process and may create fumes and, therefore, should be performed in a ventilated area.

Latex/Allergens: Ensemble does not contain latex or any other known allergen. The material is totally inert.; MSDS sheet is available

Communications: Compatible with radio systems utilizing ear microphones and speakers that integrate with respirator protective facemasks

EOD Compatibility: Suit and ensemble were specifically designed for EOD units and toxic munitions handlers

Warranty: See manual

GENERAL

Tychem® CPF 3, Coverall with Short Overhood, Certified to NFPA 1994 Class 3

Model: C3610T

DuPont Personal Protection
5401 Jefferson Davis Highway
Richmond, Virginia 23234
Customer Service
800-931-3456 (Tel)
843-335-8599 (Fax)
personalprotection@usa.dupont.com

Manufacturer Type: Domestic
Information Source: <http://www.personalprotection.com>
Responder Knowledge Database (RKB)
Status: The vendor has responded—6/3/2005

**NFPA Certification:**

NFPA 1994 Class 3, 2001 Edition

OSHA EPA Level:

Level B

NFPA Certification Number:

CBT-DUP-01
CBT-DUP-43 with 3M FR-M40
Respirator
CBT-DUP-44 with MSA Millennium
Respirator

Certifying Organization:

SEI

Date Certified/Expected:

October 21, 2005
May 24, 2005
Intertek—Annual reverifications

Required Boots:

Onguard Industries—Hazmax boot (87012). Boot must be worn over the integrated bootie (sold separately).

Required Gloves:

Attached dual layer glove system:
Over glove—Ansell Neoprene #29-845
Inner glove—Ansell Barrier® #2-100

Respiratory Equipment: MSA Millennium Respirator (10051286, 10051287, 10051288); Canister (10046570) NIOSH CBRN #TC-14G-270
3M FR-M40 Respirator (FR-M40-10, -20, -30); Canister (FR-15-CBRN) NIOSH CBRN #TC-14G-0271 (respirators sold separately)

Unit Cost: \$141

Availability: In stock. If not in stock, standard lead time is 4 wk to 6 wk.

References: Used by numerous Hazmat teams and Federal 1st Responders

Other Certifications: Not applicable

Independent Testing: Not applicable

Material Technology: The NFPA 1994 Class 3 certified CPF 3 ensemble provides an extremely durable material that has been tested against a broad range of chemicals.

Tychem® CPF 3—A multi-layer barrier film laminated to a durable 67.8 g/m² (2.0 oz/yd²) polypropylene substrate. Seams are sewn and sealed with hot air welded tape. The gloves are jam-fit construction. The garment has an attached sock with boot-top covers. A user-supplied boot must be worn over the attached sock with the boot-top covers pulled down over the upper portion of the boot to prevent liquid pooling inside the boot. Permeation and physical property data are available online at: www.personalprotection.dupont.com, or you can request a copy from customer service at 800-931-3456.

Design/Configuration: Suit is adjustable to accommodate various body types. Currently, this garment does not have a pass-through(s). Pass-throughs can be installed but first must be NFPA certified (minimum order required). Front entry.

Ensemble Design and Description: 1. The ensemble shall include a coverall and overhood which shall be constructed from a multiple-layer film based composite material.

2. The material, seams, visor, and gloves shall demonstrate no measurable chemical permeation for a period of 1 h when tested with dimethyl sulfate, lewisite, mustard, sarin, and VX.

3. The coverall and overhood ensemble is available in model number C3610T (3T464).

4. All seams in the suit and overhood shall be stitched with nylon thread and covered with heat-sealed tape on the outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.

5. The suit shall be constructed in a coverall design with an attached respirator fit hood, attached sock boots, and attached jam fit glove system. The zipper shall be constructed of 100 % polyester and shall be covered by a double storm flap made of the base fabric.
 6. The sock boots shall be made from the base material to allow the use of a replaceable overboot. The boot area shall be covered by a splash guard. (Note: An NFPA certified boot must be worn with the suit ensemble in order to meet NFPA certification.)
 7. The attached dual layer glove system shall consist of an Ansell Barrier® inner glove with an Ansell stretch neoprene outer glove.
 8. The overhood shall be shoulder length with a multi-layer face shield and snap attachment.
 9. The view window in the overhood shall be made of 40 mil polished PVC and shall have an overlay of 5 mil FEP Teflon® permanently mounted over the visor.
 10. Each unit of the ensemble shall have a unique serial number.
 11. The coverall and overhood ensemble shall meet all the requirements set forth in NFPA 1994 Class 3 and shall be certified as such by the SEI. The ensemble shall have proper labeling which states NFPA 1994 Certification and includes the SEI logo.
 12. In addition to the certification, current permeation data must be provided on all chemicals tested against the suit fabric.
 13. Note: Tychem; ensembles are certified to NFPA 1994 Standards assuming all specified components are worn as well as any other necessary protection such as respirators, boots, etc.
- Required Elements:** Attached bootie worn with outer boot and replaceable attached gloves
 Respiratory equipment—Currently, this garment does not have a pass-through(s). Pass-throughs can be installed but first must be NFPA certified. Minimum order required.
 Overhood

OPERATIONAL

- CAs Protected Against:** NFPA 1994 Class 2/3 CA, vapor ensemble plus additional CA protection
BAs Protected Against: Exceeds NFPA 1994 liquid penetration and liquid biological threat protection
TIMs Protected Against: Meets NFPA 1994 Class 2/3 liquid and/or gas permeation resistance requirements
Duration of Protection: Between 60 min and 120 min. Duration controlled by heat stress and respirator capability.

Acrylonitrile—107-13-1—100 %—13 min—0.75—ASTM F 739
 Ammonia—7664-41-7—100 % gas—12 min—1.4—ASTM F 739
 Carbon disulfide—75-15-0—100 %—16 min—0.51—ASTM F 739
 Chlorine—7782-50-5—100 % gas—>480 min—<0.1—ASTM F 739
 Chlorosulfonic acid—7790-94-5—100 %—330 min—0.97—ASTM F 739
 Ethylene oxide—75-21-8—100 % gas—>480 min—<0.01—ASTM F 739
 Formaldehyde (37 %)—50-00-0—100 %—>480 min—<0.1—ASTM F 739
 Hydrogen chloride—7647-01-0—100 % gas—>480 min—<0.01—ASTM F 739
 Hydrogen cyanide—74-90-8—100% gas—30 min—1.06—ASTM F 739
 Hydrogen fluoride—7664-39-3—100 % gas—170 min—6.7—ASTM F 739
 Hydrogen sulfide—7783-06-4—100 % gas—Immediate—1.8—ASTM F 739
 Methyl isocyanate—624-83-9—100 %—12 min—0.25—ASTM F 739
 Phosgene—75-44-5—100 % gas—>480 min—<0.1—ASTM F 739
 Phosphorous trichloride—7719-12-2—100 %—>480 min—<0.1—ASTM F 739
 Sulfuric acid, concentrated—7664-93-9—95–98 %—>480 min—<0.1—ASTM F 739
 Titanium tetrachloride—7550-45-0—100 %—120 min—11.6—ASTM F 739

- Ensemble Application:** IDLH environments or atmosphere with less than 19.5 % oxygen concentration is respirator dependent.
 Radiation protection against radioactive particles, not ionizing neutrons, gamma-rays, or x-ray radiation. Deep frozen media depends on additional thermal protection of hands. Biological.
Flame Resistance: No

HUMAN FACTORS

- Ensemble Weight:** Between 5.9 kg (13 lb) and 8.2 kg (18 lb)
 Ensemble weight (less components): 1.95 kg (4.30 lb)
 Ensemble weight (plus components): 4.69 kg (10.35 lb)*
 *weight consists of suit with Ongaard Hazmax boots, size 11, with no pass-throughs
 Unit area weight of material used: 107 g/m² (4.5 oz/yd²); material thickness of the ensemble: 406 μ (16 mil)
 **unit weight and thickness apply to garment material only
 The face shield is constructed of 2 layers: 127 μ (5 mil) Teflon® and 1016 μ (40 mil) PVC.

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted. Test subject was able to complete all tasks as specified in the standard.

Construction: The garment is constructed with double-taped seams to provide barrier against liquids and aerosols and increase durability. The overhood is shoulder length with snap attachment and provides a multi-layer face shield. The attached 2-layer glove system provides a liquid tight seal and increased dexterity. Seams are sewn and sealed with hot air welded tape. All seams in the suit and overhood shall be stitched with nylon thread and covered with heat-sealed tape on the outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric. The face shield is constructed of 2 layers; 5 mil Teflon® and 40 mil PVC.

Colors: Brown—Please contact customer service for special product applications

Dexterity: <200 %—based on results of NFPA certification test

Visual Acuity/Visibility: Visual acuity is better than or equal to 20/35

FOV: Not specified

Don/Doff: Assistance is not required for donning and doffing. 60 s—varies with practice, skill, and whether assistance is provided.

Operational Limitations: Users should use WBGT method for heat stress environmental modeling and a clothing correction factor of 10 °C (50 °F) for hooded coveralls and higher for encapsulated ensembles. Working in hot, humid environments depends on level of work activity, rest/work cycle, health of the individual, as well as temperature, humidity, wind speed, and radiant heating.

MCC Capability: Ensemble has the ability to be used with a microclimate cooling system. Currently, this garment does not have a pass-through(s). Pass-throughs can be installed but first must be NFPA certified. Minimum order required.

Environmental Conditions: Ensemble has met the cold temperature performance test. Glove has met independent cold temperature performance tests and exceeds standard's requirements.

LOGISTICS/TRAINING

TDP: Technical data package is included with all NFPA certified garments. For additional copies, please call customer service at 800-931-3456.

Training:

- **Training Hours:** Level of training on Tychem® garments depends on prior qualifications and training of end user. A HazMat technician requires less product-specific training than a novice user.
- **Training Required:** Level of training on Tychem® garments depends on prior qualification and training of end-user. A HazMat technician requires less product specific training than a novice user.
- **Training Available:** Name of training course—Last Line of Defense. Training does not result in certification.
- **Manuals Available:** Technical data package and permeation guide available with each suit. User manuals are included with all NFPA certified suits and all Level A suits. For additional copies, please visit our website at: www.personalprotection.dupont.com, or call customer service at 800-931-3456.

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused. See user's manual.

Cleaning Products: Garments should be clean and dry before use. Water and mild, household dishwashing liquid should be used to clean these garments. These garments may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water, and air-dried. Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. Do not dry clean these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach.

Use/Reuse: Discard if contaminated. Disposal per jurisdictional regulations.

Shelf Life: 6 yr to 10 yr—DuPont™ suggests Tychem® chemical garments can be used as long as they pass a visual inspection test, and in the case of Level A garments, the ASTM F1052 inflation test. Tychem® chemical garments do not have a fixed shelf life. DuPont™ suggests retiring garments to “Training Use Only” 5 yr after date of receipt. See storage life statement at www.personalprotection.com.

Maintenance Required: All PPE should be inspected prior to each use, refer to 29 CFR 1910, Subpart I, Personal Protective Equipment Standards for General Industry. See the DuPont™ Personal Protection (DPP) user manual for specific instructions. (Extra copies are available online at www.personalprotection.dupont.com). Maintenance frequency is before and after each use and at least annually.

Maintenance Cost: Not specified

Storage Conditions: Temperature range: <49 °C (<120 °F). Relative humidity range: 0 % to 100 %. Preferably, garments should be stored in a cool, dark, dry location, free of dirt and insects. Sunlight, ozone, high temperatures >49 °C (>120 °F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers. Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Consumables: Not applicable

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. 4X and 5X are available.

SPECIAL PARAMETERS

Health Hazards: If the garment has elastic wrists, ankles and/or an elastic hood opening, the elastic may contain natural rubber latex

Latex/Allergens: Garment contains latex; Garments are considered “articles” and are exempt from MSDS reporting requirements. The garments are nonhazardous.

Communications: Currently, this garment does not have a pass-through(s), however, ensemble has the ability to interface with a communications system. Pass-throughs can be installed but first must be NFPA certified. Minimum order required.

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (protective bomb suit) protective system

Warranty: DuPont makes no guarantee of results and assumes no obligation or liability in connection with the use of DuPont garments and accessories. It is the user’s responsibility to determine the level of hazards and the proper personal protective equipment needed. DuPont warrants to the purchaser/end user only for a period of 90 d from date the garment or accessory was shipped to the purchaser/end user or, for a period of 12 mo from the date the encapsulated garment was shipped to the purchaser/end user that the garment and accessory, if any, are free of defects in materials and workmanship. Since conditions of use are outside DuPont’s control, DuPont makes no other warranties of any kind, expressed or implied, including, without limitation, no warranties of merchantability or fitness for a particular use and assumes no liability in connection with any use of the DuPont garment and accessories. This warranty is void in the event any party including purchaser/end user modifies the garment or accessory in any way. The sole and exclusive remedy for all purchasers and/or end users for any and all claims, losses, injuries or damages of any kind relating to or arising from DuPont garments and accessories, shall be the refund of the purchase price or the replacement or repair of any garment or accessory found to contain a defect in materials or workmanship upon inspection by DuPont. Only DuPont shall determine the form of remedy (repair, replacement, or refund) for items containing a defect in materials or workmanship. No warranty claim shall be honored unless received by DuPont within 90 d of the date the garment or accessory was shipped to the purchaser and/or end user or, within 12 mo from the date the encapsulated garment was shipped to the purchaser/end user. In no event shall DuPont be liable for any special, incidental, indirect, punitive or consequential damages, whether arising from contract, tort, warranty, representation, instruction, design or manufacturing defects, or any other cause or theory. Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user’s responsibility to determine the level of risk and the proper protective equipment needed for the user’s particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent right.

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GENERAL

Tychem® CPF 3 NFPA 1994 Class 3 Coverall and Chest Length Overhood Ensemble

Model: C3611T

DuPont Personal Protection
5401 Jefferson Davis Highway
Richmond, Virginia 23234
Customer Service
800-931-3456 (Tel)
843-335-8599 (Fax)
personalprotection@usa.dupont.com

Manufacturer Type: Domestic
Information Source: <http://www.personalprotection.com>
Responder Knowledge Database (RKB)
Status: The vendor has responded—4/14/2006

**NFPA Certification:**

NFPA 1994 Class 3, 2001 Edition

OSHA EPA Level:

Level B

NFPA Certification Number:

CBT-DUP-01
CBT-DUP-43 with 3M FR-M40
Respirator
CBT-DUP-44 with MSA Millennium
Respirator

Certifying Organization:

SEI

Date Certified/Expected:

October 21, 2005
Intertek—Annual reverifications

Required Boots:

Onguard Industries—Hazmax boot (87012). Boot must be worn over the integrated bootie (sold separately).

Required Gloves:

Attached dual layer glove system:
Over glove—Ansell Neoprene #29-845
Inner glove—Ansell Barrier® #2-100

Respiratory Equipment: MSA Millennium Respirator (10051286, 10051287, 10051288); Canister (10046570) NIOSH CBRN #TC-14G-270
3M FR-M40 Respirator (FR-M40-10, -20, -30); Canister (FR-15-CBRN) NIOSH CBRN #TC-14G-0271 (respirators sold separately)

Unit Cost: \$141**Availability:** In stock. If not in stock, standard lead time is 4 wk to 6 wk.**References:** Used by numerous Hazmat teams and Federal 1st Responders**Other Certifications:** Not applicable**Independent Testing:** Not applicable**Material Technology:** The NFPA 1994 Class 3 certified CPF 3 provides an extremely durable material that has been tested against a broad range of chemicals.Tychem® CPF 3—A multi-layer barrier film laminated to a durable 67.8 g/m² (2.0 oz/yd²) polypropylene substrate.**Design/Configuration:** Suit is adjustable to accommodate various body types. Currently, this garment does not have a pass-through(s). Pass-throughs can be installed but first must be NFPA certified (minimum order required). Front entry.**Ensemble Design and Description:** Two-piece set certified to NFPA 1994, Class 3. Overhood features taped seams and is chest length with wrap-around multi-layer face shield and adjustable strap attachment. Coverall features taped seams, attached hood with respirator fit, front zipper closure, storm flap, attached chemical barrier glove system with PVC outer glove, attached sock boots, outer boot flaps, and comes with a user manual. Seams are sewn and sealed with hot air welded tape. The gloves are jam-fit construction. The garment has an attached sock with boot-top covers. A user-supplied boot must be worn over the attached sock with the boot-top covers pulled down over the upper portion of the boot to prevent liquid pooling inside the boot. Permeation and Physical Property Data are available online at: www.personalprotection.dupont.com or you can request a copy from customer service at 800-931-3456.

1. The ensemble shall include a coverall and overhood which shall be constructed from a multiple-layer, film-based composite material.

2. The material, seams, visor, and gloves shall demonstrate no measurable chemical permeation for a period of 1 h when tested against dimethyl sulfate, lewisite, mustard, sarin, and VX.
3. The coverall and overhead ensemble is available in model number C3611T.
4. All seams in the suit and overhead shall be stitched with nylon thread and covered with heat-sealed tape on the outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.
5. The suit shall be constructed in a coverall design with an attached respirator fit hood, attached sock boots, and attached jam fit glove system. The zipper shall be constructed of 100 % polyester and shall be covered by a double storm flap made of the base fabric.
6. The sock boots shall be made from the base material to allow the use of a replaceable overboot. The boot area shall be covered by a splash guard. (Note: An NFPA certified boot must be worn with the suit ensemble in order to meet NFPA certification.)
7. The attached dual layer glove system shall consist of an Ansell Barrier® inner glove with an Ansell stretch neoprene outer glove.
8. The overhead shall be chest length with a wrap around multi-layer face shield and adjustable snap attachment.
9. The view window in the overhead shall be made of 40 mil polished PVC and shall have an overlay of 5 mil FEP Teflon® permanently mounted over the visor.
10. Each unit of the ensemble shall have a unique serial number.
11. The coverall and overhead ensemble shall meet all the requirements set forth in NFPA 1994 Class 3 and shall be certified as such by the SEI. The ensemble shall have proper labeling which states NFPA 1994 Certification and includes the SEI logo.
12. In addition to the certification, current permeation data must be provided on all chemicals tested against the suit fabric.
13. Note: Tychem; ensembles are certified to NFPA 1994 Standards assuming all specified components are worn as well as any other necessary protection such as respirators, boots, etc.

Required Elements: Attached bootie worn with outer boot

Attached gloves are nonreplaceable

Respiratory equipment—Currently, this garment does not have a pass-through(s). Pass-throughs can be installed but first must be NFPA certified. Minimum order required.

Overhead and 3M FR-M40 or MSA Millenium respirator

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 2/3 CA, vapor ensemble plus additional CA protection

BAs Protected Against: Exceeds NFPA 1994 liquid penetration and liquid biological threat protection

TIMs Protected Against: Meets NFPA 1994 Class 2/3 liquid and/or gas permeation resistance requirements

Duration of Protection: Greater than or equal to 60 min and less than 119 min. Duration controlled by heat stress and respirator capability.

Acrylonitrile—107-13-1—100 %—13 min—0.75—ASTM F 739

Ammonia—7664-41-7—100 % gas—12 min—1.4—ASTM F 739

Carbon disulfide—75-15-0—100 %—16 min—0.51—ASTM F 739

Chlorine—7782-50-5—100 % gas—>480 min—<0.1—ASTM F 739

Chlorosulfonic acid—7790-94-5—100 %—330 min—0.97—ASTM F 739

Ethylene oxide—75-21-8—100 % gas—>480 min—<0.01—ASTM F 739

Formaldehyde (37 %)—50-00-0—100 %—>480 min—<0.1—ASTM F 739

Hydrogen chloride—7647-01-0—100 % gas—>480 min—<0.01—ASTM F 739

Hydrogen cyanide—74-90-8—100% gas—30 min—1.06—ASTM F 739

Hydrogen fluoride—7664-39-3—100 % gas—170 min—6.7—ASTM F 739

Hydrogen sulfide—7783-06-4—100 % gas—Immediate—1.8—ASTM F 739

Methyl isocyanate—624-83-9—100 %—12 min—0.25—ASTM F 739

Phosgene—75-44-5—100 % gas—>480—<0.1—ASTM F 739

Phosphorous trichloride—7719-12-2—100 %—>480 min—<0.1—ASTM F 739

Sulfuric acid, concentrated—7664-93-9—95–98 %—>480 min—<0.1—ASTM F 739

Titanium tetrachloride—7550-45-0—100 %—120 min—11.6—ASTM F 739

Ensemble Application: IDLH environments or atmosphere with less than 19.5 % oxygen concentration is respirator dependent.

Radiation protection against radioactive particles, not ionizing neutrons, gamma-rays, or x-ray radiation. Deep frozen media depends on additional thermal protection of hands. Biological.

Flame Resistance: No

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 1.95 kg (4.30 lb)

Ensemble weight (plus components): 4.69 kg (10.35 lb)*

*weight consists of suit with Onguard Hazmax Boots, size 11, with no pass-throughs

Unit area weight of material used: 107 g/m² (4.5 oz/yd²); material thickness of the ensemble: 406 μ (16 mil)**

**unit weight and thickness apply to garment material only

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted. Test subject was able to complete all tasks as specified in the standard.

Construction: The garment is constructed with double-taped seams to provide barrier against liquids and aerosols and increase durability. The overhood is chest length with snap attachment and provides a multi-layer face shield. The attached 2-layer glove system provides a liquid tight seal and increased dexterity. All seams in the suit and overhood are stitched with nylon thread and covered with heat-sealed tape on the outside of the suit. The tape used to cover the seams is a film composite with equal to or greater barrier than the base fabric. The face shield is constructed of 2 layers; 5 mil Teflon® and 40 mil PVC.

Colors: Brown—Please contact customer service for special product applications

Dexterity: <200 %—based on results of NFPA certification test

Visual Acuity/Visibility: Visual acuity is better than or equal to 20/35

FOV: Not specified

Don/Doff: Assistance is not required for donning and doffing. 60 s—varies with practice, skill, and whether assistance is provided

Operational Limitations: Users should use WBGT method for heat stress environmental modeling and a clothing correction factor of 10 °C (50 °F) for hooded coveralls and higher for encapsulated ensembles. Working in hot, humid environments depends on level of work activity, rest/work cycle, health of the individual, as well as temperature, humidity, wind speed, and radiant heating.

MCC Capability: Ensemble has the ability to be used with a microclimate cooling system. Currently, this garment does not have a pass-through(s). Pass-throughs can be installed but first must be NFPA certified. Minimum order required.

Environmental Conditions: Ensemble has met the cold temperature performance test. Glove has met independent cold temperature performance tests and exceeds standard's requirements.

LOGISTICS/TRAINING

TDP: Technical data package is included with all NFPA certified garments. For additional copies, please call customer service at 800-931-3456.

Training:

- **Training Hours:** Level of training on Tychem® garments depends on prior qualifications and training of end user. A HazMat technician requires less product-specific training than a novice user.
- **Training Required:** Level of training on Tychem® garments depends on prior qualification and training of end-user. A HazMat technician requires less product specific training than a novice user.
- **Training Available:** Name of training course—Last Line of Defense. Training does not result in certification.
- **Manuals Available:** Technical data package and permeation guide available with each suit. User manuals are included with all NFPA certified suits and all Level A suits. For additional copies, please visit our website at: www.personalprotection.dupont.com, or call customer service at 800-931-3456.

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused. See user's manual.

Cleaning Products: Garments should be clean and dry before use. Water and mild, household dishwashing liquid should be used to clean these garments. These garments may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water, and air-dried. Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. Do not dry clean these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach.

Use/Reuse: Discard if contaminated. Disposal per jurisdictional regulations.

Shelf Life: 6 yr to 10 yr—DuPont™ suggests Tychem® chemical garments can be used as long as they pass a visual inspection test, and in the case of Level A garments, the ASTM F1052 inflation test. Tychem® chemical garments do not have a fixed shelf life. DuPont™ suggests retiring garments to “Training Use Only” 5 yr after date of receipt. See storage life statement at www.personalprotection.com.

Maintenance Required: All PPE should be inspected prior to each use, refer to 29 CFR 1910, Subpart I, Personal Protective Equipment Standards for General Industry. See the DuPont™ Personal Protection (DPP) user manual for specific instructions. (Extra copies are available online at www.personalprotection.dupont.com). Maintenance frequency is before and after each use and at least annually.

Maintenance Cost: Not specified.

Storage Conditions: Temperature range: <49 °C (<120 °F). Relative humidity range: 0 % to 100 %. Preferably, garments should be stored in a cool, dark, dry location, free of dirt and insects. Sunlight, ozone, high temperatures >49 °C (>120 °F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers. Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Consumables: Not applicable

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. 4X and 5X are available.

SPECIAL PARAMETERS

Health Hazards: If the garment has elastic wrists, ankles and/or an elastic hood opening, the elastic may contain natural rubber latex

Latex/Allergens: Garment contains latex; Garments are considered “articles” and are exempt from MSDS reporting requirements. The garments are nonhazardous.

Communications: Currently, this garment does not have a pass-through(s); however, ensemble has the ability to interface with a communications system. Pass-throughs can be installed but first must be NFPA certified. Minimum order required.

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (protective bomb suit) protective system

Warranty: DuPont makes no guarantee of results and assumes no obligation or liability in connection with the use of DuPont garments and accessories. It is the user’s responsibility to determine the level of hazards and the proper personal protective equipment needed. DuPont warrants to the purchaser/end user only for a period of 90 d from date the garment or accessory was shipped to the purchaser/end user or, for a period of 12 mo from the date the encapsulated garment was shipped to the purchaser/end user that the garment and accessory, if any, are free of defects in materials and workmanship. Since conditions of use are outside DuPont’s control, DuPont makes no other warranties of any kind, expressed or implied, including, without limitation, no warranties of merchantability or fitness for a particular use and assumes no liability in connection with any use of the DuPont garment and accessories. This warranty is void in the event any party including purchaser/end user modifies the garment or accessory in any way. The sole and exclusive remedy for all purchasers and/or end users for any and all claims, losses, injuries or damages of any kind relating to or arising from DuPont garments and accessories, shall be the refund of the purchase price or the replacement or repair of any garment or accessory found to contain a defect in materials or workmanship upon inspection by DuPont. Only DuPont shall determine the form of remedy (repair, replacement, or refund) for items containing a defect in materials or workmanship. No warranty claim shall be honored unless received by DuPont within 90 d of the date the garment or accessory was shipped to the purchaser and/or end user or, within 12 mo from the date the encapsulated garment was shipped to the purchaser/end user. In no event shall DuPont be liable for any special, incidental, indirect, punitive or consequential damages, whether arising from contract, tort, warranty, representation, instruction, design or manufacturing defects, or any other cause or theory. Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user’s responsibility to determine the level of risk and the proper protective equipment needed for the user’s particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent right.

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GENERAL

JetGuard® PLUS Class 3 Ensemble

Model: 5332018

Indutex USA
3005 West Sixth Street
Wilmington, Delaware 19805
302-351-4079 (Tel)

Manufacturer Type: Foreign

Indutex S.p.A
Via S.Francesco
8/10 20011

Corbetta (MI) Italy
+39 0297 238 711 (Tel)
+39 0297 238 799 (Fax)
info@indutex.it

Information Source: <http://www.indutexusa.com>

Responder Knowledge Database (RKB)

Status: The vendor has responded—5/15/2006

**NFPA Certification:**

NFPA 1994 Class 3, 2001 Edition

OSHA EPA Level:

Level B

NFPA Certification Number:

CBT-IND-01

Certifying Organization:

SEI

Date Certified/Expected:

June 24, 2005

Required Boots:

Onguard Hazmax EZ-Fit Boot (87015) are sold separately. The low-cut design allows the user to don and doff the boots without any assistance.

Required Gloves:

Over glove—N/A
Outer glove—Tri (Talley Rand Industries)—HyTrial #18–NDFB–7 to #18–NDFB–12 (size 10)
Inner glove—(Kimberly-Clark)—Purple Nitrile-Xtra Exam Glove p/n #55090, 50601, 50602, 50603, 50604 (size XL)
The double glove system uses nitrile gloves for both the outer and inner gloves. This unique glove system was designed to replace butyl gloves in the WMD market. This system passed CA testing with the following chemicals: distilled sulfur mustard (HD), lewisite (L), sarin (GB), V-agent (VX), and dimethyl sulfate (DMA).

Respiratory Equipment: The respirator (sold separately) used in the testing of this ensemble was the Millennium mask from MSA. This is a popular mask in the industry which minimizes the requirements to switch respirators to remain compliant.

Unit Cost: \$125

Availability: In stock

References: NYPD, FDNY, CIA, and FBI

Other Certifications: Contact USA representative for detailed list

Independent Testing: Raw material was tested by TNO Laboratory following the NATO procedures (quantity passed after 4 h exposure) as Finable procedures (breakthrough times comparable with ASTM F739). All tests are performed with a 30 °C (86 °F) temperature and with enclosed method.

Biological tested following prEN 14126:2001 norm that includes the ASTM F1670 and ASTM F1671 test method.

Nuclear protection—garments passed all the tests included in EN 1073-2 norm for the protection against nuclear contaminated particles.

Material Technology: JetGuardPLUS uses the Tessaform® material from Indutex S.p.A. Indutex is a market leader of Level B and Level C clothing in Europe. This material equals or out performs any U.S. manufactured material in the industry. Its strength, comfort, and chemical resistance is unlike any material in its category.

Design/Configuration: No visor—no CO₂ buildup

Ensemble Design and Description: This ensemble was designed using an over hood without the use of a visor. Carbon dioxide buildup is impossible with this open hood system. Double flap closure for extra protection and boot flap design to increase donning speed and to ensure liquid tight results.

Required Elements: MSA Millennium mask (sold separately), attached nitrile gloves, and boots (sold separately)

Attached gloves, nonreplaceable; attached bootie worn with outer boot; and certified pass-throughs

OPERATIONAL

CAs Protected Against: GB, GA, and L NATO tests are not applicable because the NATO procedure doesn't take into consideration GD ($<0.05 \mu\text{g}/\text{cm}^2$); HD ($<0.13 \mu\text{g}/\text{cm}^2$); and VX ($<0.05 \mu\text{g}/\text{cm}^2$)

BAs Protected Against: Synthetic blood under hydrostatic pressure, bloodborne infective agents [Phi-X 174 bacteriophage), penetration of infecting agents by contact ($>150 \text{ min}$), biologically contaminated aerosols and powders

TIMs Protected Against: Suit material is protective against most chemicals. Meets 1994, 1991/1992 ASTM F 1001 battery of 21 chemicals and meets NFPA 1994 Class 2/3 Liquid and/or gas permeation resistance requirements.

Duration of Protection: Not specified

Not specified

Ensemble Application: First responders, first receivers, tactical operations, crisis management, medical, decontamination missions, and law enforcement

Flame Resistance: Not specified

HUMAN FACTORS

Ensemble Weight: $<0.45 \text{ kg}$ (1 lb) (without components); Varies (with components)

Unit area weight of material used: $3.8 \text{ g}/\text{m}^2$ (1.3 oz/yd²)

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted for the ensemble

Construction: Welded seams

Colors: Gray

Dexterity: The nitrile double glove system does not compromise dexterity

Visual Acuity/Visibility: The JetGuard Plys hood does not use a visor, therefore vision will not be impaired

FOV: The JetGuard Plys hood does not use a visor, therefore vision will not be impaired

Don/Doff: Assistance not needed

Operational Limitations: None

MCC Capability: Yes, but not tested

Environmental Conditions: To date, these tests have not been done on the garment

LOGISTICS/TRAINING

TDP: TDP is available

Training:

- **Training Hours:** Not specified
- **Training Required:** Training is required
- **Training Available:** Not specified
- **Manuals Available:** Manuals are available

Cleanability: One time use per required by NFPA

Cleaning Products: Not applicable

Use/Reuse: One time use per required by NFPA

Shelf Life: 5 yr

Maintenance Required: None

Maintenance Cost: Not applicable

Storage Conditions: High-tech military-approved packaging is used for protecting sensitive products. Heat-sealed water-vapor barrier bag that meets Mil-B 131 Film foil requirements. Opaque protection helps prevent UV and sunlight deterioration. Tough handling and adverse storage conditions will not damage the product.

Consumables: Not specified

Consumables Costs: Not applicable

Package Shape/Size (Storage): 0.011 m^3 (0.4 ft³). Vacuum packaged; foil pouch available upon request.

Sizes Available: Small, medium, large, X-large, 2X-large, 3X large, 4X-large, and 5X-large

SPECIAL PARAMETERS

Communications: Has communications Interface capability

EOD Compatibility: Is EOD compatible

Health Hazards: None

Latex/Allergens: Contains no latex or other allergens; MSDS is available

Warranty: Not specified

GENERAL

Kappler Zytron™ 300 NFPA 1994 Class 3 Hooded Coverall

Model: Z3HCF TN

Stock: Z3HCF

Kappler, Inc.
115 Grimes Drive
PO Box 490
Guntersville, Alabama 35976
Adam Terrell, Military Product Manager
256-505-4005 (Tel)
800-600-4019 (Tel)
256-505-4151 (Fax)
jcarroll@kappler.com



Manufacturer Type: Domestic
Information Source: <http://www.kappler.com>
Responder Knowledge Database (RKB)
Status: The vendor has responded—4/21/2006

NFPA Certification:

NFPA 1994 Class 3, 2001 Edition

OSHA EPA Level:

Level B

NFPA Certification Number:

CBT-KPR-02

Certifying Organization:

SEI

Date Certified/Expected:

April 8, 2005

Required Boots:

Onguard Industries—Hazmax (87012) boots available from Kappler but not sold with suits

Required Gloves:

Outer glove—Ansell Neoprene #29-865 (size 10)
Inner barrier layer—Ansell Barrier #2-100 (size 10)
Sold attached to suits

Respiratory Equipment: MSA Millennium APR with Cap 1 canister, TC-14G-0270 CBRN. APR in small, medium, and large (sold separately). The Zytron 300 was tested and is certified as an ensemble, only when using the MSA Millennium APR and Cap 1 canister.

Unit Cost: \$202

Availability: Available for sale into military and medical markets

References: Not specified

Independent Testing: Testing was conducted at Battelle Labs in accordance with NFPA 1994, 2001 Edition Standard on Protective Ensembles for Chemical/Biological Terrorism Incidents

Material Technology: Multi-layer barrier film laminated to one side of a durable polypropylene substrate. Greater physical strength and chemical hold-out protection when compared to other film products. Provides protection in situations where there is a potential for light to moderate chemical splash.

Design/Configuration: Ensemble is adjustable to accommodate various body types. Front entry and size specific design.

Ensemble Design and Description: Zytron™ 300 NFPA 1994 Class 3 Certified Hooded Coverall, 36 in (XS to Medium) and 40 in (LG-5X) zipper on right side, zip closes downward. Neoprene gasket around face opening designed to provide liquid tight seal around facemask. Double storm flap with hook and loop closure. Sealed on integral gloves: Ansell Barrier inner, outer Ansell Neoprene gloves. Attached sock boots with splash guards. (Sock boots to be worn inside regular work boots.) Heat-sealed seams. Inner and outer gloves are permanently attached by stitching, heat sealing and/or adhesives. Integrated face seal for respirator facepiece eliminates the need for a separate overhead.

Required Elements: Respiratory equipment, attached gloves that are nonreplaceable, and attached bootie worn with outer boot MSA Millennium APR with Cap 1 canister—TC 14G-0270 CBRN

Attached gloves are nonreplaceable

Boot purchased separately by user

No certified pass-throughs

OPERATIONAL

CAs Protected Against: Equal to NFPA 1994 Class 2/3 CA permeation resistance [droplet 10 g/m² (0.42 oz/yd²)] Bis (2-chloroethyl) sulfide (HD)—>480 min—4.0 µg/cm²

Isopropyl methylfluorophosphonate (GB)—>480 min—1.25 µg/cm²

Chlorovinyl arsenedichloride (L)—>240 min—4.0 µg/cm²

O-ethyl S-(2-diisopropylaminoethyl) methylphosphonothiolate (Nerve: VX)—>480 min—1.25 µg/cm²

BA's Protected Against: Exceeds NFPA 1994 by providing “systems level” aerosol threat protection

TIMs Protected Against: Meets NFPA 1994 Class 2/3 liquid and/or gas permeation resistance requirements

Duration of Protection: 1 h based on NFPA limits

Liquids:

Acetone—>480 min—ND—0.120 ppm

Acetonitrile—50 min—0.67 µg/cm²/min—0.190 ppm

Carbon disulfide—>480 min—ND—0.100 ppm

Dichloromethane—24 min—28 µg/cm²/min—0.050 ppm

Diethylamine—>480 min—ND—0.020 ppm

Dimethylformamide—151 min—1.63 µg/cm²/min—0.020 ppm

Ethyl Acetate—>480 min—ND—0.020 ppm

Hexane—>480 min—ND—0.020 ppm

Methyl alcohol—43 min—0.64 µg/cm²/min—0.110 ppm

Nitrobenzene—>480 min—ND—0.020 ppm

Sodium hydroxide—>480 min—ND—0.025 ppm

Sulfuric acid—>480 min—ND—0.025 ppm

Tetrachloroethylene—>480 min—ND—0.020 ppm

Tetrahydrofuran—>480 min—ND—0.020 ppm

Toluene—>480 min—ND—0.160 ppm

Gases:

Ammonia gas—39 min—0.16 µg/cm²/min—0.250 ppm

1,3 Butadiene—>480 min—ND—0.020 ppm

Chlorine gas—>480 min—ND—0.100 ppm

Ethylene oxide gas—81 min—0.46 µg/cm²/min—0.020 ppm

Hydrogen chloride gas—>480 min—ND—0.100 ppm

Methyl chloride gas—>480 min—ND—0.020 ppm

Ensemble Application: Chemical handling, hazardous materials/waste clean-up, HazMat teams, and decontamination.

WARNING: There are uses, environments, and chemicals for which these garments and/or fabrics are unsuitable. It is the responsibility of the user to review available data and verify that the garment and/or fabric is appropriate for the intended use and meets all specified government and industry standards.

Flame Resistance: Do not use for fire protection. Avoid open flame or intense heat. Proper use of these suits shall be consistent with NFPA 1500, standard on fire department occupational safety and health program and 29CFR 1910.132.

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 1.36 kg (3 lb) without boots

Ensemble weight (plus components): 4.54 kg (10 lb) with boots

Unit area weight of material used: 102 g/m² (4.3 oz/yd²)

Comfort ASTM: An ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted for the ensemble (evaluation is part of compliance requirements for NFPA 1991, 1992, and 1994)

Construction: Heat-sealed (taped)—A very strong, tight seam produced when a sewn seam is covered with a strip of material which is compatible with the material. The strip is either attached by traditional cement or strapping methods, or it is attached by heat-sealing or “heat taping” as with film-laminated fabrics.

Colors: Tan

Dexterity: Dexterity performance reduction is percent bare handed control—135 % per NFPA 1994 Class 1 Testing

Visual Acuity/Visibility: Visual acuity better than or equal to 20/35

FOV: Visor is expanded shape/design, but there are no “field of view” tests results per NFPA 1994 Class 3

Don/Doff: Assistance needed for donning and/or doffing. Average donning time is less than 60 s.

Operational Limitations: This type of test information is not available; the temperature service range on the fabric has been identified and is available; however, safe working temperatures depend on a number of factors and have not been defined. There are uses and chemicals for which these garments are unsuitable. It is the responsibility of the user to review available data and verify that the garment is appropriate for the intended use and meets all specified government and industry standards.

MCC Capability: Ensemble does not have the ability to be used with a microclimate cooling system. Cooling vests can be purchased separately.

Environmental Conditions: Ensemble is compliant with NFPA 1994 Class 1 for cold temperature performance. Protective clothing is used under a variety of conditions. Garments can be exposed to a range of ambient temperatures as well as variations in the temperatures of the challenge chemical. The temperature service range for Zytron fabrics was established by performing tests at high and low temperatures. The glove has met independent cold temperature performance tests.

LOGISTICS/TRAINING

TDP: A TDP is available from Kappler and packed with each suit

Training:

- **Training Hours:** Training not required, but training documentation is available from the manufacturer
- **Training Required:** Training not required
- **Training Available:** User manual is packaged with each suit from manufacturer. Additional product and technical training is available and may be provided if necessary.
- **Manuals Available:** Use and Care Manual included with each ensemble

Cleanability: Suits are not designed to be decontaminated for re-use. Suits which become contaminated with toxic chemicals should be disposed of in a safe manner. Never reuse an ensemble that has not been thoroughly cleaned and dried.

Cleaning Products: Water and mild, household dishwashing liquid should be used to clean the suit. The suit may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water, and air-dried. Do not use any oxidative, corrosive or reactive decontamination solutions with this garment. Do not dry clean this suit. Do not use hot air or a tumbling air dryer to dry this suit.

Use/Reuse: If contaminated, ensemble cannot be cleaned and reused

Shelf Life: 6 yr to 10 yr—Under proper storage conditions, there is no evidence to indicate that the Zytron® film composite fabrics lose their protective characteristics or physical properties over time. This conclusion is based on the comparative testing of aged and new Zytron 600 fabric. Chemical suits contain components made from various polymer or rubber materials for which there is no specific shelf life data currently available. Based on the physical condition of the suit, it is recommended that downgrading suits to training use only be considered when they no longer pass the visual inspection and/or pressure test.

Maintenance Required: Suits should be stored in a cool dry area away from direct sunlight. Garments should have a visual test upon arrival from manufacturer, annually and/or after each use and a quick reinspection before each use. Product is designed for limited use so no maintenance costs.

Visual Inspection of suits should include the following steps:

1. Lay the suit on a clean, smooth surface.
2. Examine the outside of the suit for holes, cuts, or abrasions.
3. Examine the seam tape for lifts or delamination.
4. Examine the face shield lens for a tight seal and make sure the window offers clear vision.
5. Examine the suit gloves to make sure they are in good working order. Examine both inner and outer gloves for models fitted with multiple glove combinations.
6. Examine the suit zipper and zipper cover to make sure they are in good working order.
7. Examine all suit snaps, closures, adjustment straps and options to make sure they are in good working order.
8. Examine suit warning label(s) to make sure they are firmly attached and can be read easily.
9. Examine the suit material for wear cracks (similar to those found in old tires), ozone deterioration (white chalky spots), and delamination of coating from fabric. Any suits showing these signs should be replaced.
10. Defects such as holes or a malfunctioning zipper mean that it is time to discard the suit.

Maintenance Cost: Product is designed for limited use

Storage Conditions: Temperature service range:-65 °C to 93 °C (-85 °F to 200 °F)

Recommended storage conditions: -18 °C to 38 °C (0 °F to 100 °F), out of direct sunlight

Relative humidity range: <100 % rh

Consumables: Additional accessories that may be purchased include ChemTape, cooling vest, Onguard Hazmax boots, and decontamination showers

Consumables Costs: Not specified

Package Shape/Size (Storage): Cube—Less than or equal to 0.057 m³ (2.0 ft³)

Sizes Available: Small, medium, large, X-large, 2X-large, 3X-large, and 4X-large

SPECIAL PARAMETERS

Health Hazards: Ensemble does not contain allergens

Latex/Allergens: Ensemble does not contain latex; MSDS is available

Communications: Ensemble does not have the ability to interface with a communications system

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: It is the responsibility of the user to select suits which are appropriate for each intended use and which meet all health standards. Kappler is available for consultation on any proposed use. Purchaser and all suit users shall promptly notify Kappler of any claim, whether based on contract, negligence, strict liability or otherwise. The sole and exclusive remedy of the purchaser and all users and the limit of liability of Kappler for any and all losses, injuries or damages resulting from use of a Kappler product shall be the refund of the purchase price or the replacement or repair of product found to be defective within 90 d after the product is delivered. In no event shall Kappler be liable for any special, incidental or consequential damages, whether in contract or in tort, arising out of any warranties, representations, instructions or defects from any cause in connection with the Kappler products, or the sale thereof. The purchaser and the users are deemed to have accepted the terms of this limitation of warranty and liability, which terms may not be varied by any verbal or written agreement. Purchaser and all users are responsible for inspection and proper care of this product as described in the manual and are responsible for all loss or damage from use or handling that results from conditions beyond the control of the manufacturer.

GENERAL

CLD 420, Class 3 Protective Coverall

Model: CLD 420

Paul Boyé
1564 route de Legardelle
31880 LE VERNET
France
+(33) 5 34 48 21 11(Tel)
+(33) 5 34 48 21 15 (Fax)

Manufacturer Type: Foreign—French
Information Source: <http://www.paulboye.com>
BTG Technologies LLC
Francis (Butch) Brochu via
fbrochu@btgtechnologies.com
443-910-3477 (Cell)
410-939-0817 (Fax)
Status: The vendor has responded—5/15/2006

NFPA Certification:

NFPA 1994 Class 3, 2001 Edition

OSHA EPA Level:

Level B

NFPA Certification Number:

MH29806

Certifying Organization:

UL

Date Certified/Expected:

April 13, 2005

Required Boots:

Any NFPA 1994, Class 3 certified boots

Required Gloves:

The CLD 420 garment is to be worn with 6/10 Butyl gloves (Piercan model). The garment contains an inner and outer cuff with loops attached which loop over thumb.

Respiratory Equipment: CBRN Millennium Respirator Mask from MSA certified by NIOSH to 42 CFR84

Unit Cost: \$181 (depending on design and quantity requests)

Availability: 8 wk lead time—4000 suits/mo

References: French army and civil defense. Contact: Center d' Etudes du Bouchet.

Attention: Mr. Stephan, BP N 3, 91710 Vert-le-Petit

+(33) 1 69 90 84 17 (Tel)

+(33) 1 64 93 52 66 (Fax)

Other users: Swiss Army and civil defense, Singapore Army and civil defense, Belgium army, Israel civil defense, and several NATO member countries

Independent Testing: Integrity tests are performed to determine the suitability of the coverall design and manufacturing with liquid penetration. For this purpose, special techniques have been applied to the CLD 420 tactical garment design in order to meet the NFPA1994 (2001Edition) Class 3 requirements.

Whole garment liquid penetration test: After being tested for Overall Ensemble Function and Integrity (ASTM F 1154, Procedure A) the complete ensemble was subjected to Shower Test in accordance with ASTM F 1359. Water containing surfactant was sprayed (3 L/min) at the mannequin for 4 min, 1 min in each of four mannequin orientations. No water penetration was observed during the tests.

Material Technology: The 3TOX material is made from a polyethylene nonwoven support covered by a protective film which acts as a barrier against chemical toxic agents (liquid and gaseous) and biological agents. The 3TOX laminate is a patented product (U.S. Patent 5,162,148; EU Patent 0434572). Special face opening material based on Lycra faced neoprene is used to get a perfect adjustment of the hood with the gas mask.

Design/Configuration: Front entry

Ensemble Design and Description: Level B—1 piece suit impermeable military suit for use with SBCA and mask (nonwoven with barrier complex)

Required Elements: Not specified

OPERATIONAL

CAs Protected Against: 3TOX laminate and garment seams were tested against CAs. In order to simulate real contamination conditions, samples were submitted to flexural fatigue procedure followed by abrasion before being tested:

- Flexural fatigue pre-treatment—100 cycles at 45 cycles/min
- Abrasion procedure pre-treatment—100 continuous cycles according ASTM D 4157
 - L—Average cumulative permeation in 1 h shall be $<4.0 \mu\text{g}/\text{cm}^2$ —Pass
 - HD—Average cumulative permeation in 1 h shall be $<4.0 \mu\text{g}/\text{cm}^2$ —Pass
 - GB—Average cumulative permeation in 1 h shall be $<1.25 \mu\text{g}/\text{cm}^2$ —Pass
 - VX—Average cumulative permeation in 1 h shall be $<1.25 \mu\text{g}/\text{cm}^2$ —Pass
 - Dimethyl sulfate (DMA)—Average breakthrough time shall not be $<60 \text{ min}$ —Pass

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—Biological Threats). 3TOX laminate and garment seams were tested against CAs. In order to simulate real contamination conditions, samples were submitted to flexural fatigue procedure followed by abrasion before being tested:

- Flexural fatigue pre-treatment—100 cycles at 45 cycles/min
- Abrasion procedure pre-treatment—100 continuous cycles according ASTM D 4157
- Viral Penetration—ASTM 1671—no penetration

TIMs Protected Against: Permeation tests according EN 374–3 show agreement with NFPA 1994. 1991/1992 ASTM F 1001 Class 2/3 except for ammonia (35 min resistance instead of 60 min). Excellent protection against a wide variety of TIMs.

Duration of Protection: 24 h

The mission duration in contaminated area is reduced to 2 h because of the risk of heat-stress damages, not because of a lack of protection. Tested following EN 374–3–1994.

- Sodium hydroxide— $>8 \text{ h}$
- Sulfuric acid— $>8 \text{ h}$
- Nitric acid— $>8 \text{ h}$
- Acetonitrile— $>8 \text{ h}$
- n-Hexane— $>8 \text{ h}$
- Toluene— $>8 \text{ h}$
- Trichloroethylene— $>4 \text{ h}$
- Isooctane— $>8 \text{ h}$
- Xylene— $>8 \text{ h}$
- Chlorine gas— $>8 \text{ h}$

Ensemble Application: Chemical and biological incidents

Flame Resistance: Not recommended in flammable environment

HUMAN FACTORS

Ensemble Weight: Light and comfortable (the suit weighs ca. 500 g)

Unit area weight of material used: $121 \text{ g}/\text{m}^2$ (5.1 oz/yd²)

Thickness : 0.25 mm

Comfort ASTM: Mechanical characteristics of the 3TOX laminate.

Test—Standard—Requirement—Value

Burst strength—ASTM D 751— $>134 \text{ N}$ —236.6 N

Puncture propagation tear resistance—ASTM D 2582— $>25 \text{ N}$ —MD: 34.4 N, XM : 31.8 N

Cold Temperature Performance—ASTM D 2136— $<0.057 \text{ N}\cdot\text{m}$ — $<0.001 \text{ N}\cdot\text{m}$

Seam breaking strength test—ASTM D 751— $>1.31 \text{ kN}/\text{m}$ —3.20 kN/m Closure breaking strength—ASTM D 751— $>1.31 \text{ kN}/\text{m}$ —3.94 kN/m

Construction: Zipper/Closure construction: The zipper is sewn directly to the suit material and covered by storm flaps on each side which overlap. Storm flaps are closed by hook and loop tapes, both consisting of two strips of 2.54 cm (1 in) side by side.

Seams construction: Seams type used in fabrication is 0.95 cm (3/8) in ASTM D6193 Type Lsa-1 weldings with diamond pattern. All weldings are overtapped with 1.9 cm (3/4 in) chemical protective seam seal tape.

Special face opening material based on Lycra-faced Neoprene is used to get a perfect adjustment of the hood with the gas mask.

Colors: Standard colors: NATO green, white, and orange. All plain colors are available.

Dexterity: Not specified

Visual Acuity/Visibility: Not specified

FOV: Not applicable

Don/Doff: Assistance needed for donning and/or doffing. Average donning time is $<60 \text{ s}$.

Operational Limitations: Not specified

MCC Capability: Not applicable

Environmental Conditions: Not specified

LOGISTICS/TRAINING

TDP: A technical data package is available on demand

Training:

- **Training Hours:** No special training required
- **Training Required:** No special training required
- **Training Available:** Not applicable
- **Manuals Available:** User and Instruction manual is included in each coverall package. Don/Doff manual is included in each suit package.

Cleanability: Garment can be washed with hand towel and water (never use any oxidative, corrosive, reactive or solvent-containing solutions). Do not dry-clean this garment, or use any hot-air or tumbling air dryer to dry the garment.

Cleaning Products: Cleaning of the coverall can be made using water and soap

Use/Reuse: Limited use (disposal of the suit if contaminated, or reusable after visual inspection). The suit can be decontaminated with shower systems or equivalent. After decontamination, the suit must be stored in sealed bags and destroyed (by incineration).

Shelf Life: 10 yr

Maintenance Required: Garments must preferably be stored in dry, cool, and dark location. Sunlight, ozone, and high temperature might degrade the materials of this garment. Before inspection, a garment is preferably stored in its original individual package. Once inspected, garment should be stored in individual box or bags, or on hangers.

Maintenance Cost: Not specified

Storage Conditions: Temperature: -10 °C to 40 °C (14 °F to 104 °F). Relative humidity: 20 % to 80 %.

Consumables: Not specified

Consumables Costs: Not specified

Package Shape/Size (Storage): Cube—Easy storage due to the small volume of the suit

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large

SPECIAL PARAMETERS

Health Hazards: The CLD 420 coverall does not contain latex or any known allergen

Latex/Allergens: The CLD 420 coverall does not contain latex or any known allergen; MSDS is available

Communications: Easy interface with communications system worn under the hood (pass-through connections need special adaptations)

EOD Compatibility: Not applicable

Warranty: Free of material and workmanship defects for 10 yr before first use

GENERAL

The Sigmon System NFPA 1994 Class 3 Ensemble (NFPA 1994 Class III Tactical Suit, Class 3)**Model:** SGDC-NFPA-T11 (Kappler Z3HCN TN)**Stock:** SGDC-NFPA-T11

The Sigmon Group
 Kappler (Gentex, The Sigmon Group)
 P.O. Box 490
 70 Grimes Drive
 Guntersville, Alabama 35976
 Bruce Watson
 256-505-4146 (Tel)
 256-505-4151 (Fax)
 watsonb@sigmongroup.com
 clocksteve@sigmongroup.com

Manufacturer Type: Domestic
Information Source: <http://www.sigmongroup.com>
 The Sigmon Group, LLC
 630 C. Woodlake Drive
 Chesapeake, Virginia 23320
 Responder Knowledge Database (RKB)
Status: The vendor has responded—5/18/2005

**NFPA Certification:**

NFPA 1994 Class 3, 2001 Edition

OSHA EPA Level:

Level B

NFPA Certification Number:

MH29774

Certifying Organization:

UL

Date Certified/Expected:

April 13, 2005

Required Boots:

Onguard Industries—Hazmax (87012)

Required Gloves:

Attached Ansell Neoprene, Model 29-865

Respiratory Equipment: MSA Millennium mask and M-40**Unit Cost:** \$359**Availability:** Manufactured on demand. There is a 30 d lead time for minimum order.**References:** Not specified**Other Certifications:** Not applicable**Independent Testing:** Complete test results from U.S. Army Soldier Systems Center Natick and Dugway Proving Ground**Material Technology:** Absorptive carbon material liner. The glove system is a hermetically sealed dual glove with an inner glove constructed of white three-dimensional five layer extruded film laminated to a nonwoven liner.**Design/Configuration:** Suit adjustability to accommodate various body types. Suits are size specific. Various suit sizes are available.**Ensemble Design and Description:** The garment is available in various sizes, with a front zipper and with attached gloves and booties. The suit is a taped-seam cover incorporating an integral hermetically sealed glove system, attached booties with splash guards, double storm flap, full length slide fastener with hook and pile closure, an absorptive material collar, hood, and front closure system. All openings including hood interior have an absorptive carbon material liner, thus not requiring additional overhood. The glove system is hermetically sealed dual glove with an inner glove constructed of white three-dimensional five layer extruded film laminated to a nonwoven liner.**Required Elements:** NFPA certified boot; CBRN NIOSH approved APR

Attached nonreplaceable gloves and attached bootie worn with outer boot

Certified pass-throughs

This suit can be worn with the NIOSH CBRN MSA Millennium gas mask and the 3M NIOSH CBRN M40 mask

OPERATIONAL

CAs Protected Against: Tested for nerve agents. Test data to performance will be supplied on request.**BAs Protected Against:** Tested for BAs. Test data to performance will be supplied on request.**TIMs Protected Against:** Tested for tearing agents, choking agents, and vomiting agents

Duration of Protection: 6 h

Allyl alcohol—100—140 min—vg—ASTM F739

Ammonia—100 (Gas)—>490 min

Formaldehyde—37%—31 min—vg—ASTM F739

Hydrogen bromide—48 %—>480 min—vg—ASTM F739

Hydrogen chloride—37 %—>480 min—vg—ASTM F739

Hydrogen cyanide—100 %—>480 min—vg—ASTM F739

Hydrogen fluoride—60 %—>480 min—e—ASTM F739

Ensemble Application: This suit can be worn by first responders who need to enter into a CB Incident**Flame Resistance:** Not flame resistant**HUMAN FACTORS****Ensemble Weight:** Less than 1.4 kg (3 lb)

Not specified

Comfort ASTM: Test subject was able to perform exercises protocol ASTM F1154**Construction:** All seams are sewn, taped, heat-sealed, and/or bound**Colors:** Tan**Dexterity:** >200%—6 different subjects were tested. Small—average 157.7 %; large—average 130.8 %.**Visual Acuity/Visibility:** Visual acuity is better than or equal to 20/35 (through the suit visor or faces shield together with the respirator to be worn)**FOV:** Not applicable**Don/Doff:** No assistance needed for donning, but assistance is needed for doffing. Time is <60 s.**Operational Limitations:** In higher temperatures there will be heat stress. A cooling system can be worn underneath suit; it is not supplied by the manufacturer.**MCC Capability:** Ensemble includes pass-throughs for microclimate cooling**Environmental Conditions:** Ensemble has met independent cold temperature performance tests**LOGISTICS/TRAINING****TDP:** Technical data package is available**Training:**

- **Training Hours:** Less than 8 h provided by the manufacturer. Technical data package is available from manufacturer.
- **Training Required:** Not specified
- **Training Available:** Manual, CD, or video—Tactical Ensemble Training. Training results in certification.
- **Manuals Available:** User and instruction manuals are available

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) cannot be cleaned and reused**Cleaning Products:** Not applicable**Use/Reuse:** Cannot decontaminate**Shelf Life:** 11 yr to 15 yr**Maintenance Required:** Maintenance not required**Maintenance Cost:** Not applicable**Storage Conditions:** -35 °C to 49 °C (-32 °F to 120 °F)**Consumables:** Onguard Haxmax boots**Consumables Costs:** Not specified**Package Shape/Size (Storage):** Small orange kit bag—Less than or equal to 0.057 m³ (2.0 ft³)**Sizes Available:** X-small, small, medium, large, X-large, XX-large, and XXX-large. Can be sized to 5X.**SPECIAL PARAMETERS****Health Hazards:** All gloves contain traces of allergens**Latex/Allergens:** Gloves contain a small trace of latex; MSDS not available**Communications:** Ensemble can interface with a communication system**EOD Compatibility:** Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system**Warranty:** Warranty is provided in Technical Data Package

GENERAL

Tychem® Reflector®, Front Entry Level A Garment, Certified to NFPA 1991**Model:** RF600T

DuPont Personal Protection
 5401 Jefferson Davis Highway
 Richmond, Virginia 23234
 Customer Service
 800-931-3456 (Tel)
 843-335-8599 (Fax)
 personalprotection@usa.dupont.com

Manufacturer Type: Domestic
Information Source: <http://www.personalprotection.com>
 Responder Knowledge Database (RKB)
Status: The vendor has responded—6/6/2005



NFPA Certification:
 NFPA 1991, 2005 Edition

OSHA EPA Level:
 Level A

NFPA Certification Number:
 CBT-DUP-06

Certifying Organization:
 SEI

Date Certified/Expected:
 February 25, 2003 SEI
 Intertek—Annual reverifications

Required Boots:
 Onguard Industries—Hazmax (87012) boots sold separately
 from an authorized Onuard dealer

Required Gloves:
 Attached glove system:
 Outer glove: Ansell Edmont #k2300-12 Kevlar®
 Middle glove: Guardian #IN-35 Neoprene
 Neoprene inner glove: Ansell Barrier® Style 2-100

Respiratory Equipment: SCBA must be certified compliant to NFPA 1981 (sold separately)

Unit Cost: \$1.63K

Availability: In stock. If not in stock, standard lead time is 4 wk to 6 wk.

References: Used by numerous Hazmat teams and Federal 1st Responders

Other Certifications: Not applicable

Independent Testing: Not applicable

Material Technology: Tychem® Reflector®—A patented, heavy duty aluminized fabric laminated to a multi-layer film barrier. Tychem® Reflector® is the first single-skin, limited-use garment to be certified to NFPA 1991. The combination of layers provides excellent physical strength, far above other limited-use fabrics. The aluminized outer layer provides superior cut resistance and abrasion protection. Tychem® Reflector® passes the entire ASTM F1001 Chemical Test Battery with no breakthrough in 8 h. Seams are sewn and sealed with hot air welded tape. The gloves are attached to the sleeve by an inverted, rigid ring, and clamp system. The garment has an attached sock with boot-top covers. A user-supplied boot must be worn over the attached sock with the boot-top covers pulled down over the upper portion of the boot to prevent liquid pooling inside the boot. Permeation and physical property data are available online at: www.personalprotection.dupont.com, or you can request a copy from customer service at 800-931-3456.

Design/Configuration: Suit is adjustable to accommodate various body types. Front entry.

Ensemble Design and Description:

1. The suit shall be constructed from a single fabric, 18 oz/yd² composite comprised of a woven fiberglass substrate with a reflective aluminized flame resistant outer surface and a multi-layer chemical barrier inner surface.
2. The material shall demonstrate no measurable chemical permeation when tested against the ASTM F1001 Liquid and Gas Chemical Test Battery for a period of 8 h using the permeation test method ASTM F739.
3. The suit material must pass the NFPA test requirements for the ASTM 1358 Flame Impingement test.
4. The suit material must pass the NFPA test requirements for the Radiant Reflectivity Performance (RRP) test per NFPA 1976, Section 4-3.1. Material must have a minimum rating of 20.
5. The suit material must pass the NFPA test requirements for the Thermal Protective Performance (TPP) test per NFPA 1991, 94 Edition, Section 7. Material must have a minimum rating of 12.

6. All seams shall be stitched with Nomex thread and covered with heat-sealed film-type seam tape. The tape used to cover the outside seams shall be of a Teflon® material. The tape used to cover the inside seams shall be of a similar composition as the films used in the base fabric and offer virtually the same chemical resistance as the fabric. Seams must be double-taped on the inside and single taped on the outside of the suit.
7. The suit shall be a front entry design with a gas tight zipper. The zipper shall be covered by an overlapping double storm flap made of the base fabric. The storm flap shall have hook and loop closure. (Optional: Rear Entry Design—46451).
8. The glove system shall consist of: a Neoprene Ansell Barrier® inner glove, a Guardian #IN-35 middle glove, and an Ansell Edmont #k2300-12 Kevlar® outer glove. The gloves shall be field replaceable by means of an internal ring and clamp system. The interface between the glove and sleeve shall form an airtight seal.
9. The view window shall be made of 40 mil polished PVC with a 5 mil Teflon® FEP overlay, and must offer a minimum visor window size of 31 cm (12.2 in) in vertical length x 34 cm (13.4 in) in width to provide the wearer a large field of vision.
10. The suit shall be constructed with “sock” boots made from Responder® fabric to allow the use of a replaceable overboot. The boot area shall be covered by a minimum 36 cm (14 in) high splash guard with easy-access hook and loop closures.
11. The suit shall be constructed with “Dolman” style sleeves, which will allow the worker to easily remove his hands into the inside of the suit, but without excessive material under the arms which can catch on sharp objects.
12. The suit shall contain an internal waist belt system for support and improved fit.
13. The suit shall be designed to accommodate a 1 h breathing apparatus and shall allow for use of a hard hat.
14. The suit shall be constructed with two (2) one-way demand exhalation valves. The exhalation valves shall be protected from splash by valve covers made of the suit material.
15. The suit shall be designed to accommodate an optional internal air distribution system.
16. Each suit shall have a unique serial number and shall be tested for suit integrity prior to delivery. This test shall be conducted using positive air pressure as specified in ASTM F1052.
17. The suit shall meet the base requirements set forth in NFPA 1991 Vapor-Protective Suits for Hazardous Chemical Emergencies (2000 Edition) and the optional chemical and biological terrorism protection requirements. The suit shall be certified as such by the SEI.
18. Suits must be packaged in reusable storage bags with carrying handles. Bags should have zipper closures and bags have color-coded handles to easily identify the protection level.
19. The suit shall be capable of being field tested for integrity using an optional positive pressure test kit. (Style Number: 990810).
20. Suit must have Care and Usage Instruction Manual.

Required Elements: Attached bootie worn with outer boot and replaceable attached gloves
 Respiratory equipment—the ensemble has the ability to accommodate pass-through(s) for respirators
 Number of pass-throughs—up to 3

Pass-through options:

- ISI Pass-Through
- Draeger with Hansen Fitting Pass-Through
- Draeger with Foster Fitting Pass-Through
- Interspiro Pass-Through
- Scott with Hansen Fitting Pass-Through
- Scott with Schrader Fitting Pass-Through
- Survivair® with Foster Fitting Pass-Through
- Survivair® with Hansen Fitting Pass-Through
- Survivair® with Schrader Fitting Pass-Through
- MSA Dual Purpose with Foster Fitting Pass-Through
- MSA Dual Purpose with Hansen Fitting Pass-Through
- MSA with Schrader Fitting Pass-Through

OPERATIONAL

CAs Protected Against: FPA 1994 Class 1 and 1991, 2005 Edition CB option plus additional CA protection

BAs Protected Against: Exceeds NFPA 1994 liquid penetration and liquid biological threat protection

TIMs Protected Against: Meets 1994, 1991, and 1992 plus additional chemical threats

Rad/Nuc Materials Protected Against: Yes

Duration of Protection: Greater than 60 min and 119 min. Duration controlled by heat stress and respirator capability.

Acetone cyanohydrin—75-86-5—100 %—>480 min—<0.01—ASTM F 739

Acrolein—107-02-8—100 %—>480 min—<0.02—ASTM F 739

Acrylonitrile—107-13-1—100 %—>480 min—<0.001—ASTM F 739

Allyl alcohol—107-18-6—100 %—>480 min—<0.1—ASTM F 739

Ammonia—7664-41-7—100 % gas—>480 min—<0.1—ASTM F 739
Arsine—7784-42-1—100 % gas—>480 min—<0.01—ASTM F 739
Boron trichloride—10294-34-5—100 % gas—>480 min—<0.02—ASTM F 739
Boron trifluoride—7637-07-02—100 % gas—>480 min—<0.1—ASTM F 739
Carbon disulfide—75-15-0—100 %—>480 min—<0.1—ASTM F 739
Carbon monoxide—630-08-0—100 % gas—330 min—0.1—ASTM F 739
Chlorine—7782-50-5—100 % gas—>480 min—<0.1—ASTM F 739
Chlorosulfonic acid—7790-94-5—100%—180 min—98—ASTM F 739
Diborane—19287-45-7—10 % (gas)—>480 min—<0.005—ASTM F 739
Dimethylhydrazine—57-14-7—100 %—>480 min—<5.0—ASTM F 739
Ethylene dibromide—106-93-4—100%—>480 min—<0.1—ASTM F 739
Ethylene oxide—75-21-8—100 % gas—>480 min—<0.1—ASTM F 739
Formaldehyde (37 %)—50-00-0—100 %—>480 min—<0.09—ASTM F 739
Hydrogen bromide—10035-10-6—100 % gas—>480 min—<0.1—ASTM F 739
Hydrogen chloride—7647-01-0—100 % gas—>480 min—<0.1—ASTM F 739
Hydrogen cyanide—74-90-8—100 % gas—>480 min—<0.05—ASTM F 739
Hydrogen fluoride—7664-39-3—100 % gas—>480 min—<0.0174—ASTM F 739
Hydrogen selenide—7783-07-5—100 % gas—>480 min—<0.01—ASTM F 739
Hydrogen sulfide—7783-06-4—100 % gas—>480 min—<0.01—ASTM F 739
Methanesulfonyl chloride—124-63-0—100%—>480 min—<0.0006—ASTM F 739
Methyl chloroformate—79-22-1—100 %—>480 min—<0.011—ASTM F 739
Methyl hydrazine—60-34-4—100 %—>480 min—<0.01—ASTM F 739
Methyl isocyanate—624-83-9—100 %—>480 min—<0.013—ASTM F 739
Methyl mercaptan—74-93-1—100 % gas—>480 min—<0.001—ASTM F 739
Nitric acid, fuming—7697-37-2—100 %—>480 min—<0.033—ASTM F 739
Phosgene—75-44-5—100 % gas—>480 min—<0.1—ASTM F 739
Phosphine—7803-51-2—100 % gas—>480 min—<0.01—ASTM F 739
Phosphorous trichloride—7719-12-2—100 %—>480—<0.1—ASTM F 739
Sulfur dioxide—7449-09-05—100 % gas—>480 min—<0.01—ASTM F 739
Sulfur trioxide—7449-11-9—100 %—90 min—696—ASTM F 739
Sulfuric acid, concentrated—7664-93-9—95-98 %—>480 min—<0.1—ASTM F 739
Sulfuryl chloride—7791-25-5—100 %—>480 min—<0.1—ASTM F 739
Titanium tetrachloride—7550-45-0—100 %—>480 min—<0.1—ASTM F 739
Tungsten hexafluoride—7783-83-6—100 % gas—>480 min—<0.026—ASTM F 739

Ensemble Application: IDLH environments or atmosphere with less than 19.5 % oxygen concentration is respirator dependent. Radiation protection against radioactive particles, not ionizing neutrons, gamma-rays, or x-ray radiation. Deep frozen media depends on additional thermal protection of hands. Biological.

Flame Resistance: Certified to NFPA 1991 as long as any other necessary protection such as respirators, boots, etc., are worn

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 6.6 kg (14.57 lb)

Ensemble weight (plus components): 9.35 kg (20.62 lb)*

* weight consists of suit with Onguard Hazmax Boots, size 11, with no pass-throughs

Unit area weight of material used: 379 g/m² (16 oz/yd²) **

Material thickness of the ensemble: 1499 μ (59 mil)**

** unit weight and thickness apply to garment material only

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted. Test subject was able to complete all tasks as specified in the standard.

Construction: This garment is constructed with double-taped seams to provide barrier against liquids, aerosols and vapors, and increase durability. The face shield is constructed of 2 layers: 5 mil Teflon® and 40 mil PVC. All seams shall be stitched with Nomex thread and covered with heat-sealed film-type seam tape. The tape used to cover the outside seams shall be of a Teflon® material. The tape used to cover the inside seams shall be of a similar composition as the films used in the base fabric and offer virtually the same chemical resistance as the fabric. Seams must be double-taped on the inside and single taped on the outside of the suit.

Colors: Aluminized—Please contact customer service for special product applications

Dexterity: <600 %—based on results of NFPA certification test

Visual Acuity/Visibility: Visual acuity is better than or equal to 20/35

FOV: Not specified

Don/Doff: Assistance is required for donning and doffing. 60 s—varies with practice, skill, and whether assistance is provided.

Operational Limitations: Users should use WBGT method for heat stress environmental modeling and a clothing correction factor of 10 °C (50 °F) for hooded coveralls and higher for encapsulated ensembles. Working in hot, humid environments depends on level of work activity, rest/work cycle, health of the individual, as well as temperature, humidity, wind speed, and radiant heating.

MCC Capability: Ensemble has the ability to be used with a microclimate cooling system. User must specify pass-throughs prior to garment manufacturing.

Environmental Conditions: Ensemble has met the cold temperature performance test. Glove has met independent cold temperature performance tests and exceeds standard's requirements.

LOGISTICS/TRAINING

TDP: Technical data package is included with all NFPA certified garments. For additional copies, please call customer service at 800-931-3456.

Training:

- **Training Hours:** Level of training on Tychem® garments depends on prior qualifications and training of end user. A HazMat technician requires less product-specific training than a novice user. Training documentation is available from the manufacturer.
- **Training Required:** Level of training on Tychem® garments depends on prior qualification and training of end-user. A HazMat technician requires less product specific training than a novice user.
- **Training Available:** Name of training course—Last Line of Defense. Training does not result in certification.
- **Manuals Available:** Technical data package and permeation guide available with each suit. User manuals are included with all NFPA certified suits and all Level A suits. For additional copies, please visit our website at: www.personalprotection.dupont.com, or call customer service at 800-931-3456.

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused. See user's manual.

Cleaning Products: Garments should be clean and dry before use. Water and mild, household dishwashing liquid should be used to clean these garments. These garments may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water, and air-dried. Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. Do not dry clean these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach.

Use/Reuse: Discard if contaminated. Disposal per jurisdictional regulations.

Shelf Life: 6 yr to 10 yr—DuPont™ suggests Tychem® chemical garments can be used as long as they pass a visual inspection test, and in the case of Level A garments, the ASTM F1052 inflation test). Tychem® chemical garments do not have a fixed shelf life. DuPont™ suggests retiring garments to “Training Use Only” 5 yr after date of receipt. See storage life statement at www.personalprotection.com.

Maintenance Required: All PPE should be inspected prior to each use, refer to 29 CFR 1910, Subpart I, Personal Protective Equipment Standards for General Industry. See the DuPont™ Personal Protection (DPP) user manual for specific instructions. (Extra copies are available online at www.personalprotection.dupont.com). Maintenance frequency is before and after each use and at least annually.

Maintenance Cost: Not specified

Storage Conditions: Temperature range: <49 °C (<120 °F). Relative humidity range: 0 % to 100 %.

Preferably, garments should be stored in a cool, dark, dry location, free of dirt and insects. Sunlight, ozone, high temperatures >49 °C (>120 °F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers. Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Consumables: Not applicable

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. 4X is available.

SPECIAL PARAMETERS

Health Hazards: If the garment has elastic wrists, ankles and/or an elastic hood opening, the elastic may contain natural rubber latex

Latex/Allergens: Garment contains latex; Garments are considered “articles” and are exempt from MSDS reporting requirements. The garments are nonhazardous.

Communications: Ensemble has the ability to interface with a communications system. There is a minimum order requirement for NFPA 1991 and 1994 Class 1 ensembles for certification of pass-through.

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: DuPont makes no guarantee of results and assumes no obligation or liability in connection with the use of DuPont garments and accessories. It is the user's responsibility to determine the level of hazards and the proper personal protective equipment needed. DuPont warrants to the purchaser/end user only for a period of 90 d from date the garment or accessory was shipped to the purchaser/end user or, for a period of 12 mo from the date the encapsulated garment was shipped to the purchaser/end user that the garment and accessory, if any, are free of defects in materials and workmanship. Since conditions of use are outside DuPont's control, DuPont makes no other warranties of any kind, expressed or implied, including, without limitation, no warranties of merchantability or fitness for a particular use and assumes no liability in connection with any use of the DuPont garment and accessories. This warranty is void in the event any party including purchaser/end user modifies the garment or accessory in any way. The sole and exclusive remedy for all purchasers and/or end users for any and all claims, losses, injuries or damages of any kind relating to or arising from DuPont garments and accessories, shall be the refund of the purchase price or the replacement or repair of any garment or accessory found to contain a defect in materials or workmanship upon inspection by DuPont. Only DuPont shall determine the form of remedy (repair, replacement, or refund) for items containing a defect in materials or workmanship. No warranty claim shall be honored unless received by DuPont within 90 d of the date the garment or accessory was shipped to the purchaser and/or end user or, within 12 mo from the date the encapsulated garment was shipped to the purchaser/end user. In no event shall DuPont be liable for any special, incidental, indirect, punitive or consequential damages, whether arising from contract, tort, warranty, representation, instruction, design or manufacturing defects, or any other cause or theory. Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user's responsibility to determine the level of risk and the proper protective equipment needed for the user's particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent right.

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GENERAL

Tychem® Responder®, Front Entry Level A Garment, Certified to NFPA 1991**Model:** RS600T**Stock:** RS600T (front entry)

DuPont Personal Protection
 5401 Jefferson Davis Highway
 Richmond, Virginia 23234
 Customer Service
 800-931-3456 (Tel)
 843-335-8599 (Fax)
 personalprotection@usa.dupont.com

Manufacturer Type: Domestic**Information Source:** <http://www.personalprotection.com>
Responder Knowledge Database (RKB)**Status:** The vendor has responded—6/6/2005

NFPA Certification:
 NFPA 1991, 2005 Edition

OSHA EPA Level:
 Level A

NFPA Certification Number:
 VPS-KAP-03

Certifying Organization:
 SEI

Date Certified/Expected:
 April 22, 2005 SEI
 Intertek—Annual reverifications

Required Boots:
 Onguard Industries—Hazmax (87012) boots not included

Required Gloves:
 Attached glove System:
 Outer glove: Ansell Edmont #k2300-12 Kevlar®
 Middle glove: Guardian #IN-35 Neoprene
 Neoprene inner glove: Ansell Barrier® Style 2-100

Respiratory Equipment: Required to be NFPA 1981 certified (sold separately)**Unit Cost:** \$1.74K**Availability:** In stock. If not in stock, standard lead time is 4 wk to 6 wk.**References:** Used by numerous Hazmat teams and Federal 1st Responders**Other Certifications:** Not applicable**Independent Testing:** Not applicable

Material Technology: The NFPA 1991, 2005 edition certified Responder® provides an extremely durable material that has been tested against more than 230 different chemicals. The outdoorsuit is an aluminized fiberglass overcover (Kappler #65160/65161). Tychem® Responder® is a patented fabric consisting of multiple barrier films laminated to both sides of a tough substrate material. Seams are sewn and sealed with hot air welded tape. The gloves are attached to the sleeve by an inverted, rigid ring and clamp system. The garment has an attached sock with boot-top covers. A user-supplied boot must be worn over the attached sock with the boot-top covers pulled down over the upper portion of the boot to prevent liquid pooling inside the boot. Permeation and physical property data are available online at: www.personalprotection.dupont.com, or you can request a copy from customer service at 800-931-3456.

Design/Configuration: Suit is adjustable to accommodate various body types. Front entry.

Ensemble Design and Description: 1. The ensemble shall include a suit, which shall be constructed from a multiple-layer, film based composite material. The overcover shall be constructed from a woven Fiberglass substrate with an aluminized Mylar reflective film.

2. The material, seams, visor, and gloves shall demonstrate no measurable chemical permeation for a period of 1 h when tested against the 15 recommended liquid test chemicals and the 6 recommended gaseous test chemicals listed in the NFPA 1991 (2000 Edition). In addition to the NFPA test data, the manufacturer shall be able to provide chemical permeation data results against the base fabric for at least 200 chemicals.

3. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.

4. The ensemble shall be front entry with an outer suit (overcover) made of aluminized fiberglass.

5. The suit shall be constructed with an airtight zipper. The zipper shall be covered by a double overlapping storm flap made of the base fabric.
6. The glove system shall consist of: a Neoprene Ansell Barrier® inner glove, a Guardian #IN-35 middle glove, and an Ansell Edmont #k2300-12 Kevlar® outer glove. The gloves shall be field replaceable by means of an internal ring and clamp system. The interface between the glove and sleeve shall form an airtight seal.
7. The view window in the suit shall be made of 40 mil polished PVC and shall have an overlay of 5 mil FEP Teflon® permanently mounted over the visor. The overcover shall be constructed with a view window of 10 mil FEP Teflon®.
8. The inner garment shall have three pressure-demand exhalation valves. The valves shall be covered by splash guards of the base material. The overcover shall have one pressure-demand exhalation valve, covered by a splash guard.
9. The suit shall be constructed with sock boots made from the base material to allow the use of a replaceable overboot. The boot area shall be covered by a splash guard. The overcover ankles are finished with elastic. (Note: An NFPA certified boot must be worn with the suit ensemble in order to meet NFPA certification.)
10. The suit shall contain an internal waist belt system for support and improved fit.
11. The suit shall be designed to accommodate a SCBA and shall allow for the use of an ANSI certified hard hat.
12. Each unit of the ensemble shall have a unique serial number. The suit shall be tested for airtight integrity prior to delivery. This test shall be conducted using positive air pressure as specified in ASTM F1052.
13. The suit shall be capable of being field tested for airtight integrity using an optional positive pressure test kit (style No. 990810).
14. The ensemble shall meet the base requirements set forth in NFPA 1991 Vapor-Protective Suits for Hazardous Chemical Emergencies (2000 Edition) and the optional chemical and biological terrorism protection requirements. The ensemble shall be certified as such by the SEI.
15. The ensemble shall have proper labeling which states NFPA 1991 Certification and includes the SEI logo.
16. Certification from the Safety Equipment Institute, which verifies NFPA 1991 compliance, must be furnished with each bid.
17. In addition to the certification, current permeation data must be provided on all chemicals tested against the suit fabric.
18. The suit manufacturer shall provide a complete software system for selecting chemical protective clothing, including test data, product information/details, and technical support information.

Required Elements: Attached bootie worn with outer boot and replaceable attached gloves

Aluminized over cover

Respiratory equipment—the ensemble has the ability to accommodate pass-through(s) for respirators

Number of pass-throughs—up to 3

Pass-through options:

- ISI Pass-Through
- Draeger with Hansen Fitting Pass-Through
- Draeger with Foster Fitting Pass-Through
- Interspiro Pass-Through
- Scott with Hansen Fitting Pass-Through
- Scott with Schrader Fitting Pass-Through
- Survivair® with Foster Fitting Pass-Through
- Survivair® with Hansen Fitting Pass-Through
- Survivair® with Schrader Fitting Pass-Through
- MSA Dual Purpose with Foster Fitting Pass-Through
- MSA Dual Purpose with Hansen Fitting Pass-Through
- MSA with Schrader Fitting Pass-Through

OPERATIONAL

CAs Protected Against: FPA 1994 Class 1 and 1991 CB Option plus additional CA protection

BAs Protected Against: Exceeds NFPA 1994 liquid penetration and liquid biological threat protection

TIMs Protected Against: Meets 1994, 1991, and 1992 plus additional chemical threats

Rad/Nuc Materials Protected Against: Yes

Duration of Protection: Greater than 60 min and 119 min. Duration controlled by heat stress and respirator capability.

Acetone cyanohydrin—75-86-5—100 %—>480 min—<0.01—ASTM F 739

Acrolein—107-02-8—100 %—>480 min—<0.02—ASTM F 739

Acrylonitrile—107-13-1—100 %—>480 min—<0.1—ASTM F 739

Allyl alcohol—107-18-6—100 %—>480 min—<0.1—ASTM F 739

Ammonia—7664-41-7—100 % gas—>480 min—<0.1—ASTM F 739

Arsine—7784-42-1—100 % gas—>480 min—<0.01—ASTM F 739

Boron trichloride—10294-34-5—100 % gas—>480 min—<0.1—ASTM F 739

Boron trifluoride—7637-07-02—100 % gas—>480 min—<0.1—ASTM F 739
Carbon disulfide—75-15-0—100 %—>480 min—<0.1—ASTM F 739
Carbon monoxide—630-08-0—100 % gas—330 min—0.1—ASTM F 739
Chlorine—7782-50-5—100 % gas—>480 min—<0.1—ASTM F 739
Chloroacetone—78-95-5—100 %—>480 min—<0.08—ASTM F 739
Chlorosulfonic acid—7790-94-5—100 %—>480 min—<0.1—ASTM F 739
Diborane—19287-45-7—10 % (gas)—>480 min—<0.1—ASTM F 739
Dimethylhydrazine—57-14-7—100 %—>480 min—<0.1—ASTM F 739
Ethylene dibromide—106-93-4—100 %—>480 min—<0.1—ASTM F 739
Ethylene oxide—75-21-8—100 % gas—>480 min—<0.1—ASTM F 739
Fluorine—7782-41-4—100 % gas—>480 min—<0.1—ASTM F 739
Formaldehyde (37 %)—50-00-0—100 %—>480 min—<0.09—ASTM F 739
Hydrogen bromide—10035-10-6—100 % gas—>480 min—<0.1—ASTM F 739
Hydrogen chloride—7647-01-0—100 % gas—>480 min—<0.1—ASTM F 739
Hydrogen cyanide—74-90-8—100 % gas—>480 min—<0.1—ASTM F 739
Hydrogen fluoride—7664-39-3—100 % gas—>480 min—<0.1—ASTM F 739
Hydrogen selenide—7783-07-5—100 % gas—>480 min—<0.01—ASTM F 739
Hydrogen sulfide—7783-06-4—100 % gas—>480 min—<0.01—ASTM F 739
Methanesulfonyl chloride—124-63-0—100% —>480 min—<0.0006—ASTM F 739
Methyl chloroformate—79-22-1—100 %—>480 min—<0.01—ASTM F 739
Methyl hydrazine—60-34-4—100 %—>480 min—<0.1—ASTM F 739
Methyl isocyanate—624-83-9—100 %—>480 min—<0.1—ASTM F 739
Methyl mercaptan—74-93-1—100 % gas—>480 min—<0.1—ASTM F 739
Nitric acid, fuming—7697-37-2—100 %—>480 min—<0.033—ASTM F 739
Nitrogen dioxide—10102-44-0—100 % gas—>480 min—<0.001—ASTM F 739
Phosgene—75-44-5—100 % gas—>480 min—<0.1—ASTM F 739
Phosphine—7803-51-2—100 % gas—>480 min—<0.1—ASTM F 739
Phosphorous trichloride—7719-12-2—100 %—>480 min—<0.1—ASTM F 739
Sulfur dioxide—7449-09-05—100 % gas—>480 min—<0.1—ASTM F 739
Sulfur trioxide—7449-11-9—100 %—90 min—696—ASTM F 739
Sulfuric acid, concentrated—7664-93-9—95–98 %—>480—<0.1—ASTM F 739
Sulfuryl chloride—7791-25-5—100 %—>480—<0.1—ASTM F 739
Titanium tetrachloride—7550-45-0—100 %—>480—<0.1—ASTM F 739
Tungsten hexafluoride—7783-83-6—100 % gas—>480—<0.1—ASTM F 739

Ensemble Application: IDLH environments or atmosphere with less than 19.5 % oxygen concentration is respirator dependent. Radiation protection against radioactive particles, not ionizing neutrons, gamma-rays, or x-ray radiation. Deep frozen media depends on additional thermal protection of hands. Biological.

Flame Resistance: Certified to NFPA 1991 assuming both the aluminized over cover and chemical protective inner suit are worn, as well as any other necessary protection such as respirators, boots, etc.

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 8.19 kg (18.05 lb)

Ensemble weight (plus components): 10.93 kg (24.10 lb)*

* weight consists of suit with Onguard Hazmax Boots, size 11, with no pass-throughs

Unit area weight of material used: 194 g/m² (8.2 oz/yd²) **

Material thickness of the ensemble: 533 μ (21 mil)**

** unit weight and thickness apply to garment material only

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted. Test subject was able to complete all tasks as specified in the standard.

Construction: The garment is constructed with double-taped seams to provide barrier against liquids, aerosols and vapors and increase durability. The face shield is constructed of 2 layers: 5 mil Teflon® and 40 mil PVC. The aluminized fiberglass overcover has a face shield of 10 mil FEP Teflon®. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.

Colors: Blue—Please contact customer service for special product applications

Dexterity: <600 %—based on results of NFPA certification test

Visual Acuity/Visibility: Visual acuity is better than or equal to 20/35

FOV: Not specified

Don/Doff: Assistance is required for donning and doffing. 60 s—varies with practice, skill, and whether assistance is provided

Operational Limitations: Users should use WBGT method for heat stress environmental modeling and a clothing correction factor of 10 °C (50 °F) for hooded coveralls and higher for encapsulated ensembles. Working in hot, humid environments depends on level of work activity, rest/work cycle, health of the individual, as well as temperature, humidity, wind speed, and radiant heating.

MCC Capability: Ensemble has the ability to be used with a microclimate cooling system. User must specify pass-throughs prior to garment manufacturing.

Environmental Conditions: Ensemble has met the cold temperature performance test. Glove has met independent cold temperature performance tests and exceeds standard's requirements.

LOGISTICS/TRAINING

TDP: Technical data package is included with all NFPA certified garments. For additional copies, please call customer service at 800-931-3456.

Training:

- **Training Hours:** Level of training on Tychem® garments depends on prior qualifications and training of end user. A HazMat technician requires less product-specific training than a novice user. Training documentation is available from the manufacturer.
- **Training Required:** Level of training on Tychem® garments depends on prior qualification and training of end user. A HazMat technician requires less product specific training than a novice user.
- **Training Available:** Name of training course—Last Line of Defense. Training does not result in certification.
- **Manuals Available:** Technical data package and permeation guide available with each suit. User manuals are included with all NFPA certified suits and all Level A suits. For additional copies, please visit our website at: www.personalprotection.dupont.com, or call customer service at 800-931-3456.

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused. See user's manual.

Cleaning Products: Garments should be clean and dry before use. Water and mild, household dishwashing liquid should be used to clean these garments. These garments may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water, and air-dried. Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. Do not dry clean these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach.

Use/Reuse: Discard if contaminated. Disposal per jurisdictional regulations.

Shelf Life: 6 yr to 10 yr—DuPont™ suggests Tychem® chemical garments can be used as long as they pass a visual inspection test, and in the case of Level A garments, the ASTM F1052 inflation test. Tychem® chemical garments do not have a fixed shelf life. DuPont™ suggests retiring garments to “Training Use Only” 5 yr after date of receipt. See storage life statement at www.personalprotection.com.

Maintenance Required: All PPE should be inspected prior to each use, refer to 29 CFR 1910, Subpart I, Personal Protective Equipment Standards for General Industry. See the DuPont™ Personal Protection (DPP) user manual for specific instructions. (Extra copies are available online at www.personalprotection.dupont.com). Maintenance frequency is before and after each use and at least annually.

Maintenance Cost: Not specified

Storage Conditions: Temperature range: <49 °C (<120 °F). Relative humidity range: 0 % to 100 %. Preferably, garments should be stored in a cool, dark, dry location, free of dirt and insects. Sunlight, ozone, high temperatures >49 °C (>120 °F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers. Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Consumables: Not applicable

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. 4X and 5X are available.

SPECIAL PARAMETERS

Health Hazards: If the garment has elastic wrists, ankles and/or an elastic hood opening, the elastic may contain natural rubber latex

Latex/Allergens: Garment contains latex; Garments are considered “articles” and are exempt from MSDS reporting requirements. The garments are nonhazardous.

Communications: Ensemble has the ability to interface with a communications system. There is a minimum order requirement for NFPA 1991 and 1994 Class 1 ensembles for certification of pass-through.

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: DuPont makes no guarantee of results and assumes no obligation or liability in connection with the use of DuPont garments and accessories. It is the user's responsibility to determine the level of hazards and the proper personal protective equipment needed. DuPont warrants to the purchaser/end user only for a period of 90 d from date the garment or accessory was shipped to the purchaser/end user or, for a period of 12 mo from the date the encapsulated garment was shipped to the purchaser/end user that the garment and accessory, if any, are free of defects in materials and workmanship. Since conditions of use are outside DuPont's control, DuPont makes no other warranties of any kind, expressed or implied, including, without limitation, no warranties of merchantability or fitness for a particular use and assumes no liability in connection with any use of the DuPont garment and accessories. This warranty is void in the event any party including purchaser/end user modifies the garment or accessory in any way. The sole and exclusive remedy for all purchasers and/or end users for any and all claims, losses, injuries or damages of any kind relating to or arising from DuPont garments and accessories, shall be the refund of the purchase price or the replacement or repair of any garment or accessory found to contain a defect in materials or workmanship upon inspection by DuPont. Only DuPont shall determine the form of remedy (repair, replacement, or refund) for items containing a defect in materials or workmanship. No warranty claim shall be honored unless received by DuPont within 90 d of the date the garment or accessory was shipped to the purchaser and/or end user or, within 12 mo from the date the encapsulated garment was shipped to the purchaser/end user. In no event shall DuPont be liable for any special, incidental, indirect, punitive or consequential damages, whether arising from contract, tort, warranty, representation, instruction, design or manufacturing defects, or any other cause or theory. Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user's responsibility to determine the level of risk and the proper protective equipment needed for the user's particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent right.

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GENERAL

Tychem® Responder®, Rear Entry Level A Garment, Certified to NFPA 1991**Model:** RS601T**Stock:** RS601T (rear entry)

DuPont Personal Protection
 5401 Jefferson Davis Highway
 Richmond, Virginia 23234
 Customer Service
 800-931-3456 (Tel)
 843-335-8599 (Fax)
 personalprotection@usa.dupont.com

Manufacturer Type: Domestic
Information Source: <http://www.personalprotection.com>
 Responder Knowledge Database (RKB)
Status: The vendor has responded—6/6/2005



NFPA Certification:
 NFPA 1991, 2005 Edition

OSHA EPA Level:
 Level A

NFPA Certification Number:
 VPS-KAP-04

Certifying Organization:
 SEI

Date Certified/Expected:
 October 19, 2004 SEI
 Intertek—Annual reverifications

Required Boots:
 Onguard Industries—Hazmax (87012) boots not included

Required Gloves:
 Attached glove System:
 Outer glove: Ansell Edmont #k2300-12 Kevlar®
 Middle glove: Guardian #IN-35 Neoprene
 Neoprene inner glove: Ansell Barrier® Style 2-100

Respiratory Equipment: Required to be NFPA 1981 certified (sold separately)

Unit Cost: \$1.74K

Availability: In stock. If not in stock, standard lead time is 4 wk to 6 wk.

References: Used by numerous Hazmat teams and Federal 1st Responders

Other Certifications: Not applicable

Independent Testing: Not applicable

Material Technology: The NFPA 1991, 2005 edition certified Responder® provides an extremely durable material that has been tested against more than 230 different chemicals. The outersuit is an aluminized fiberglass overcover (Kappler #65160/65161). Tychem® Responder® is a patented fabric consisting of multiple barrier films laminated to both sides of a tough substrate material. Seams are sewn and sealed with hot air welded tape. The gloves are attached to the sleeve by an inverted, rigid ring, and clamp system. The garment has an attached sock with boot-top covers. A user-supplied boot must be worn over the attached sock with the boot-top covers pulled down over the upper portion of the boot to prevent liquid pooling inside the boot. Permeation and physical property data are available online at: www.personalprotection.dupont.com, or you can request a copy from customer service at 800-931-3456.

Design/Configuration: Suit is adjustable to accommodate various body types. Rear entry.

Ensemble Design and Description: 1. The ensemble shall include a suit, which shall be constructed from a multiple-layer, film-based composite material. The overcover shall be constructed from a woven fiberglass substrate with an aluminized Mylar reflective film.

2. The material, seams, visor, and gloves shall demonstrate no measurable chemical permeation for a period of 1 h when tested against the 15 recommended liquid test chemicals and the 6 recommended gaseous test chemicals listed in the NFPA 1991 (2000 Edition). In addition to the NFPA test data, the manufacturer shall be able to provide chemical permeation data results against the base fabric for at least 200 chemicals.

3. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.

4. The ensemble is shall be rear entry with an outer suit (overcover) made of aluminized fiberglass.

5. The suit shall be constructed with an airtight zipper. The zipper shall be covered by a double overlapping storm flap made of the base fabric.
6. The glove system shall consist of: a Neoprene Ansell Barrier® inner glove, a Guardian #IN-35 middle glove, and an Ansell Edmont #k2300-12 Kevlar® outer glove. The gloves shall be field replaceable by means of an internal ring and clamp system. The interface between the glove and sleeve shall form an airtight seal.
7. The view window in the suit shall be made of 40 mil polished PVC and shall have an overlay of 5 mil FEP Teflon® permanently mounted over the visor. The overcover shall be constructed with a view window of 10 mil FEP Teflon®.
8. The inner garment shall have three pressure-demand exhalation valves. The valves shall be covered by splash guards of the base material. The overcover shall have one pressure-demand exhalation valve, covered by a splash guard.
9. The suit shall be constructed with sock boots made from the base material to allow the use of a replaceable overboot. The boot area shall be covered by a splash guard. The overcover ankles are finished with elastic. (Note: An NFPA certified boot must be worn with the suit ensemble in order to meet NFPA certification.)
10. The suit shall contain an internal waist belt system for support and improved fit.
11. The suit shall be designed to accommodate a SCBA and shall allow for the use of an ANSI certified hard hat.
12. Each unit of the ensemble shall have a unique serial number. The suit shall be tested for airtight integrity prior to delivery. This test shall be conducted using positive air pressure as specified in ASTM F1052.
13. The suit shall be capable of being field tested for airtight integrity using an optional positive pressure test kit (style No. 990810).
14. The ensemble shall meet the base requirements set forth in NFPA 1991 Vapor-Protective Suits for Hazardous Chemical Emergencies (2000 Edition) and the optional chemical and biological terrorism protection requirements. The ensemble shall be certified as such by the SEI.
15. The ensemble shall have proper labeling which states NFPA 1991 Certification and includes the SEI logo.
16. Certification from the SEI, which verifies NFPA 1991 compliance, must be furnished with each bid.
17. In addition to the certification, current permeation data must be provided on all chemicals tested against the suit fabric.
18. The suit manufacturer shall provide a complete software system for selecting chemical protective clothing, including test data, product information/details, and technical support information.

Required Elements: Attached bootie worn with outer boot and replaceable attached gloves

Aluminized over cover

Respiratory equipment—the ensemble has the ability to accommodate pass-through(s) for respirators

Number of pass-throughs—up to 3

Pass-through options:

ISI Pass-Through

Draeger with Hansen Fitting Pass-Through

Draeger with Foster Fitting Pass-Through

Interspiro Pass-Through

Scott with Hansen Fitting Pass-Through

Scott with Schrader Fitting Pass-Through

Survivair® with Foster Fitting Pass-Through

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MSA with Schrader Fitting Pass-Through

OPERATIONAL

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BAs Protected Against: Exceeds NFPA 1994 liquid penetration and liquid biological threat protection

TIMs Protected Against: Meets 1994, 1991, and 1992 plus additional chemical threats

Rad/Nuc Materials Protected Against: Yes

Duration of Protection: Between 60 min and 119 min. Duration controlled by heat stress and respirator capability.

Acetone cyanohydrin—75-86-5—100 %—>480 min—<0.01—ASTM F 739

Acrolein—107-02-8—100 %—>480 min—<0.02—ASTM F 739

Acrylonitrile—107-13-1—100 %—>480 min—<0.1—ASTM F 739

Allyl alcohol—107-18-6—100 %—>480 min—<0.1—ASTM F 739

Ammonia—7664-41-7—100 % gas—>480 min—<0.1—ASTM F 739

Arsine—7784-42-1—100 % gas—>480 min—<0.01—ASTM F 739

Boron trichloride—10294-34-5—100 % gas—>480 min—<0.1—ASTM F 739

Boron trifluoride—7637-07-02—100 % gas—>480 min—<0.1—ASTM F 739
 Carbon disulfide—75-15-0—100 %—>480 min—<0.1—ASTM F 739
 Carbon monoxide—630-08-0—100 % gas—330 min—0.1—ASTM F 739
 Chlorine—7782-50-5—100 % gas—>480 min—<0.1—ASTM F 739
 Chloroacetone—78-95-5—100 %—>480 min—<0.08—ASTM F 739
 Chlorosulfonic acid—7790-94-5—100 %—>480 min—<0.1—ASTM F 739
 Diborane—19287-45-7—10 % (gas)—>480 min—<0.1—ASTM F 739
 Dimethylhydrazine—57-14-7—100 %—>480v—<0.1—ASTM F 739
 Ethylene dibromide—106-93-4—100 %—>480 min—<0.1—ASTM F 739
 Ethylene oxide—75-21-8—100 % gas—>480 min—<0.1—ASTM F 739
 Fluorine—7782-41-4—100 % gas—>480 min—<0.1—ASTM F 739
 Formaldehyde (37 %)—50-00-0—100 %—>480 min—<0.09—ASTM F 739
 Hydrogen bromide—10035-10-6—100 % gas—>480 min—<0.1—ASTM F 739
 Hydrogen chloride—7647-01-0—100 % gas—>480 min—<0.1—ASTM F 739
 Hydrogen cyanide—74-90-8—100 % gas—>480 min—<0.1—ASTM F 739
 Hydrogen fluoride—7664-39-3—100 % gas—>480 min—<0.1—ASTM F 739
 Hydrogen selenide—7783-07-5—100 % gas—>480 min—<0.01—ASTM F 739
 Hydrogen sulfide—7783-06-4—100 % gas—>480 min—<0.01—ASTM F 739
 Methanesulfonyl chloride—124-63-0—100% —>480 min—<0.0006—ASTM F 739
 Methyl chloroformate—79-22-1—100 %—>480 min—<0.01—ASTM F 739
 Methyl hydrazine—60-34-4—100 %—>480 min—<0.1—ASTM F 739
 Methyl isocyanate—624-83-9—100 %—>480 min—<0.1—ASTM F 739
 Methyl mercaptan—74-93-1—100 % gas—>480 min—<0.1—ASTM F 739
 Nitric acid, fuming—7697-37-2—100 %—>480 min—<0.033—ASTM F 739
 Nitrogen dioxide—10102-44-0—100 % gas—>480 min—<0.001—ASTM F 739
 Phosgene—75-44-5—100 % gas—>480 min—<0.1—ASTM F 739
 Phosphine—7803-51-2—100 % gas—>480 min—<0.1—ASTM F 739
 Phosphorous trichloride—7719-12-2—100 %—>480 min—<0.1—ASTM F 739
 Sulfur dioxide—7449-09-05—100 % gas—>480 min—<0.1—ASTM F 739
 Sulfur trioxide—7449-11-9—100 %—90 min—696—ASTM F 739
 Sulfuric acid, concentrated—7664-93-9—95–98 %—>480 min—<0.1—ASTM F 739
 Sulfuryl chloride—7791-25-5—100 %—>480 min—<0.1—ASTM F 739
 Titanium tetrachloride—7550-45-0—100 %—>480 min—<0.1—ASTM F 739
 Tungsten hexafluoride—7783-83-6—100 % gas—>480 min—<0.1—ASTM F 739

Ensemble Application: IDLH environments or atmosphere with less than 19.5 % oxygen concentration is respirator dependent. Radiation protection against radioactive particles, not ionizing neutrons, gamma-rays, or x-ray radiation. Deep frozen media depends on additional thermal protection of hands. Biological.

Flame Resistance: Certified to NFPA 1991 assuming both the aluminized over cover and chemical protective inner suit are worn, as well as any other necessary protection such as respirators, boots, etc.

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 8.18 kg (18.05 lb)

Ensemble weight (plus components): 10.93 kg (24.10 lb)*

* weight consists of suit with Onguard Hazmax Boots, size 11, with no pass-throughs

Unit area weight of material used: 194 g/sm² (8.2 oz/yd²) **

Material thickness of the ensemble: 533 μ (21 mil)**

** unit weight and thickness apply to garment material only

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted. Test subject was able to complete all tasks as specified in the standard.

Construction: The garment is constructed with double-taped seams to provide barrier against liquids, aerosols and vapors and increase durability. The face shield is constructed of 2 layers: 5 mil Teflon® and 40 mil PVC. The aluminized fiberglass overcover has a face shield of 10 mil FEP Teflon®. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.

Colors: Blue—Please contact customer service for special product applications

Dexterity: <600 %—based on results of NFPA certification test

Visual Acuity/Visibility: Visual acuity is better than or equal to 20/35

FOV: Not specified

Don/Doff: Assistance is required for donning and doffing. 60 s—varies with practice, skill, and whether assistance is provided.

Operational Limitations: Users should use WBGT method for heat stress environmental modeling and a clothing correction factor of 10 °C (50 °F) for hooded coveralls and higher for encapsulated ensembles. Working in hot, humid environments depends on level of work activity, rest/work cycle, health of the individual, as well as temperature, humidity, wind speed, and radiant heating.

MCC Capability: Ensemble has the ability to be used with a microclimate cooling system. User must specify pass-throughs prior to garment manufacturing.

Environmental Conditions: Ensemble has met the cold temperature performance test. Glove has met independent cold temperature performance tests and exceeds standard's requirements.

LOGISTICS/TRAINING

TDP: Technical data package is included with all NFPA certified garments. For additional copies, please call customer service at 800-931-3456.

Training:

- **Training Hours:** Level of training on Tychem® garments depends on prior qualifications and training of end user. A HazMat technician requires less product-specific training than a novice user. Training documentation is available from the manufacturer.
- **Training Required:** Level of training on Tychem® garments depends on prior qualification and training of end-user. A HazMat technician requires less product specific training than a novice user.
- **Training Available:** Name of training course—Last Line of Defense. Training does not result in certification.
- **Manuals Available:** Technical data package and permeation guide available with each suit. User manuals are included with all NFPA certified suits and all Level A suits. For additional copies, please visit our website at: www.personalprotection.dupont.com, or call customer service at 800-931-3456.

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused. See user's manual.

Cleaning Products: Garments should be clean and dry before use. Water and mild, household dishwashing liquid should be used to clean these garments. These garments may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water, and air-dried. Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. Do not dry clean these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach.

Use/Reuse: Discard if contaminated. Disposal per jurisdictional regulations.

Shelf Life: 6 yr to 10 yr—DuPont™ suggests Tychem® chemical garments can be used as long as they pass a visual inspection test, and in the case of Level A garments, the ASTM F1052 inflation test). Tychem® chemical garments do not have a fixed shelf life. DuPont™ suggests retiring garments to “Training Use Only” 5 yr after date of receipt. See storage life statement at www.personalprotection.com.

Maintenance Required: All PPE should be inspected prior to each use, refer to 29 CFR 1910, Subpart I, Personal Protective Equipment Standards for General Industry. See the DuPont™ Personal Protection (DPP) user manual for specific instructions. (Extra copies are available online at www.personalprotection.dupont.com). Maintenance frequency is before and after each use and at least annually.

Maintenance Cost: Not specified

Storage Conditions: Temperature range: <49 °C (<120 °F). Relative humidity range: 0 % to 100 %. Preferably, garments should be stored in a cool, dark, dry location, free of dirt and insects. Sunlight, ozone, high temperatures >49 °C (>120 °F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers. Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Consumables: Not applicable

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. 4X and 5X are available.

SPECIAL PARAMETERS

Health Hazards: If the garment has elastic wrists, ankles and/or an elastic hood opening, the elastic may contain natural rubber latex

Latex/Allergens: Garment contains latex; Garments are considered “articles” and are exempt from MSDS reporting requirements. The garments are nonhazardous.

Communications: Ensemble has the ability to interface with a communications system. There is a minimum order requirement for NFPA 1991 and 1994 Class 1 ensembles for certification of pass-through.

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: DuPont makes no guarantee of results and assumes no obligation or liability in connection with the use of DuPont garments and accessories. It is the user's responsibility to determine the level of hazards and the proper personal protective equipment needed. DuPont warrants to the purchaser/end user only for a period of 90 d from date the garment or accessory was shipped to the purchaser/end user or, for a period of 12 mo from the date the encapsulated garment was shipped to the purchaser/end user that the garment and accessory, if any, are free of defects in materials and workmanship. Since conditions of use are outside DuPont's control, DuPont makes no other warranties of any kind, expressed or implied, including, without limitation, no warranties of merchantability or fitness for a particular use and assumes no liability in connection with any use of the DuPont garment and accessories. This warranty is void in the event any party including purchaser/end user modifies the garment or accessory in any way. The sole and exclusive remedy for all purchasers and/or end users for any and all claims, losses, injuries or damages of any kind relating to or arising from DuPont garments and accessories, shall be the refund of the purchase price or the replacement or repair of any garment or accessory found to contain a defect in materials or workmanship upon inspection by DuPont. Only DuPont shall determine the form of remedy (repair, replacement, or refund) for items containing a defect in materials or workmanship. No warranty claim shall be honored unless received by DuPont within 90 d of the date the garment or accessory was shipped to the purchaser and/or end user or, within 12 mo from the date the encapsulated garment was shipped to the purchaser/end user. In no event shall DuPont be liable for any special, incidental, indirect, punitive or consequential damages, whether arising from contract, tort, warranty, representation, instruction, design or manufacturing defects, or any other cause or theory. Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user's responsibility to determine the level of risk and the proper protective equipment needed for the user's particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent right.

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GENERAL

Tychem® TK, Front Entry Level A Garment, Certified to NFPA 1991**Model:** TK600T**Stock:** TK600T (front entry)

DuPont Personal Protection
 5401 Jefferson Davis Highway
 Richmond, Virginia 23234
 Customer Service
 800-931-3456 (Tel)
 843-335-8599 (Fax)
 personalprotection@usa.dupont.com

Manufacturer Type: Domestic**Information Source:** <http://www.personalprotection.com>
Responder Knowledge Database (RKB)**Status:** The vendor has responded—6/6/2005

NFPA Certification:
 NFPA 1991, 2005 Edition

OSHA EPA Level:
 Level A

NFPA Certification Number:
 VPS-DUP-01

Certifying Organization:
 SEI

Date Certified/Expected:
 Intertek—Annual reverifications

Required Boots:

Onguard Industries—Hazmax (87012) boots not included.
 Boot must be worn over the integrated bootie for compliance to NFPA 1991 (2005 Edition).

Required Gloves:

Attached glove system:
 Outer glove: Ansell Edmont #k2300-12 Kevlar®
 Middle glove: Guardian #IN-35
 Neoprene inner glove: Ansell Barrier® Style 2-100

Respiratory Equipment: SCBA must be certified to NFPA 1981 (sold separately)**Unit Cost:** \$1.5K**Availability:** In stock. If not in stock, standard lead time is 4 wk to 6 wk.**References:** Used by numerous Hazmat teams and Federal 1st Responders**Other Certifications:** Not applicable**Independent Testing:** Not applicable**Material Technology:** The certified Tychem® TK ensemble provides an extremely durable material and boasts one of the broadest ranges of chemical protection available, successfully tested against more than 260 chemicals with no observed permeation after 8 h of continuous contact.

Tychem® TK—a patented limited-use fabric consisting of multiple nonpermeable barrier films laminated to both sides of a tough substrate material. Seams are sewn and sealed with hot air welded tape. The gloves are attached to the sleeve by an inverted, rigid ring, and clamp system. The garment has an attached sock with boot-top covers. A user-supplied boot must be worn over the attached sock with the boot-top covers pulled down over the upper portion of the boot to prevent liquid pooling inside the boot. Outersuit: Aluminized Fiberglass Gentex Fabric: Marc Mac Construction Products p/n 65160X, 65161X; and National Safety Apparel C83FF and C87FF.

Permeation and physical property data are available online at: www.personalprotection.dupont.com or you can request a copy from customer service at 800-931-3456.

Design/Configuration: Suit is adjustable to accommodate various body types. Front entry.

Ensemble Design and Description: The garment is constructed with double-taped seams to provide barrier against liquids, aerosols and vapors, and to increase durability. It has an extra wide three-layer face shield (PVC 40 mil/Teflon® 5 mil/PVC 20 mil), three-layer glove system (Neoprene/EVOH film/Kevlar® knit), expanded back (accommodates SCBA), front entry, gas-tight zipper closure, double storm flap over zipper, attached boots, outer boot flaps, knee wear pads, four exhaust valves, and internal adjustment belt. The ensemble is high-visibility lime-yellow in color. This ensemble is certified to the NFPA 1991, 2005 Edition.

1. The front entry ensemble shall include a suit, which shall be constructed from a multiple-layer, film-based composite material. The overcover shall be constructed from a woven fiberglass substrate with an aluminized Mylar reflective film.

2. The material, seams, visor, and gloves shall demonstrate no measurable chemical permeation for a period of 1 h when tested against the 15 recommended liquid test chemicals and the 6 recommended gaseous test chemicals listed in the NFPA 1991 (2000 Edition). In addition to the NFPA test data, the manufacturer shall be able to provide chemical permeation data results against the base fabric for at least 200 chemicals.
3. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.
4. The suit shall be constructed with an airtight zipper. The zipper shall be covered by a double overlapping storm flap made of the base fabric.
5. The glove system shall consist of: a Neoprene Ansell Barrier® inner glove, a Guardian #IN-35 middle glove, and an Ansell Edmont #k2300-12 Kevlar® outer glove. The gloves shall be field replaceable by means of an internal ring and clamp system. The interface between the glove and sleeve shall form an airtight seal.
6. The view window in the inner suit shall be a three layer face shield made of 40 mil polished PVC/5 mil Teflon® FEP/20 mil polished PVC. The overcover shall be constructed with a view window of 20 mil Lexan®. The suit and overcover will have an EX (extra wide) face shield.
7. The inner garment shall have four pressure demand exhalation valves. The valves shall be covered by splash guards of the base material. The overcover shall have four pressure-demand exhalation valves, covered by splash guards.
8. The suit shall be constructed with sock boots made from the base material to allow the use of a replaceable overboot. The boot area shall be covered by a splash guard. The overcover ankles are finished with elastic. (Note: An NFPA certified boot must be worn with the suit ensemble in order to meet NFPA certification.)
9. The suit shall contain an internal waist belt system for support and improved fit.
10. The suit shall be designed to accommodate a SCBA and shall allow for the use of an ANSI certified hard hat.
11. Each unit of the ensemble shall have a unique serial number. The suit shall be tested for airtight integrity prior to delivery. This test shall be conducted using positive air pressure as specified in ASTM F1052.
12. The suit shall be capable of being field tested for airtight integrity using an optional positive pressure test kit (style No. 990810).
13. The ensemble shall meet the base requirements set forth in NFPA 1991 Vapor-Protective Suits for Hazardous Chemical Emergencies (2000 Edition) and the optional liquefied gas and chemical/biological terrorism protection requirements. The ensemble shall be certified as such by the SEI.
14. The ensemble shall have proper labeling which states NFPA 1991 Certification and includes the SEI logo.

Required Elements: Attached bootie worn with outer boot and replaceable attached gloves

Aluminized over cover

Respiratory equipment—the ensemble has the ability to accommodate pass-through(s) for respirators

Number of pass-throughs—up to 3

Pass-through options:

ISI Pass-Through

Draeger with Hansen Fitting Pass-Through

Draeger with Foster Fitting Pass-Through

Interspiro Pass-Through

Scott with Hansen Fitting Pass-Through

Scott with Schrader Fitting Pass-Through

Survivair® with Foster Fitting Pass-Through

Survivair® with Hansen Fitting Pass-Through

Survivair® with Schrader Fitting Pass-Through

MSA Dual Purpose with Foster Fitting Pass-Through

MSA Dual Purpose with Hansen Fitting Pass-Through

MSA with Schrader Fitting Pass-Through

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 1 and 1991 CB option plus additional CA protection

BAs Protected Against: Exceeds NFPA 1994 liquid penetration and liquid biological threat protection

TIMs Protected Against: Meets 1994, 1991, and 1992 plus additional chemical threats

Rad/Nuc Materials Protected Against: Yes

Duration of Protection: Between 60 minutes and 119 min. Duration controlled by heat stress and respirator capability.

Acetone cyanohydrin—75-86-5—100 %—>480 min—<0.01—ASTM F 739

Acrolein—107-02-8—100 %—>480 min—<0.02—ASTM F 739

Acrylonitrile—107-13-1—100 %—>480 min—<0.001—ASTM F 739

Allyl alcohol—107-18-6—100 %—>480 min—<0.1—ASTM F 739

Ammonia—7664-41-7—100 % gas—>480 min—<0.1—ASTM F 739
 Arsine—7784-42-1—100 % gas—>480 min—<0.01—ASTM F 739
 Boron trichloride—10294-34-5—100 % gas—>480 min—<0.02—ASTM F 739
 Boron trifluoride—7637-07-02—100 % gas—>480 min—<0.1—ASTM F 739
 Carbon disulfide—75-15-0—100 %—>480 min—<0.02—ASTM F 739
 Carbon monoxide—630-08-0—100 % gas—330 min—0.1—ASTM F 739
 Chlorine—7782-50-5—100 % gas—>480 min—<0.02—ASTM F 739
 Chlorosulfonic acid—7790-94-5—100 %—>480 min—<0.1—ASTM F 739
 Diborane—19287-45-7—10 % (gas)—>480 min—<0.005—ASTM F 739
 Dimethylhydrazine—57-14-7—100 %—>480 min—<5.0—ASTM F 739
 Ethylene dibromide—106-93-4—100 %—>480 min—<0.1—ASTM F 739
 Ethylene oxide—75-21-8—100 % gas—>480 min—<0.1—ASTM F 739
 Fluorine—7782-41-4—100 % gas—>480 min—<0.002—ASTM F 739
 Formaldehyde (37 %)—50-00-0—100 %—>480 min—<0.09—ASTM F 739
 Hydrogen bromide—10035-10-6—100 % gas—>480 min—<0.1—ASTM F 739
 Hydrogen chloride—7647-01-0—100 % gas—>480 min—<0.1—ASTM F 739
 Hydrogen cyanide—74-90-8—100 % gas—>480 min—<0.01—ASTM F 739
 Hydrogen fluoride—7664-39-3—100 % gas—>480 min—<0.1—ASTM F 739
 Hydrogen selenide—7783-07-5—100 % gas—>480 min—<0.01—ASTM F 739
 Hydrogen sulfide—7783-06-4—100 % gas—>480 min—<0.01—ASTM F 739
 Methanesulfonyl chloride—124-63-0—100 %—>480 min—<0.0006—ASTM F 739
 Methyl chloroformate—79-22-1—100 %—>480 min—<0.01—ASTM F 739
 Methyl hydrazine—60-34-4—100 %—>480 min—<0.01—ASTM F 739
 Methyl isocyanate—624-83-9—100 %—>480 min—<0.013—ASTM F 739
 Methyl mercaptan—74-93-1—100 % gas—>480 min—<0.001—ASTM F 739
 Nitric acid, fuming—7697-37-2—100 %—>480 min—<0.033—ASTM F 739
 Phosgene—75-44-5—100 % gas—>480 min—<0.1—ASTM F 739
 Phosphine—7803-51-2—100 % gas—>480 min—<0.01—ASTM F 739
 Phosphorous trichloride—7719-12-2—100 %—>480 min—<0.1—ASTM F 739
 Sulfur dioxide—7449-09-05—100 % gas—>480 min—<0.01—ASTM F 739
 Sulfur trioxide—7449-11-9—100 %—90 min—696—ASTM F 739
 Sulfuric acid, concentrated—7664-93-9—95-98 %—>480 min—<0.1—ASTM F 739
 Sulfuryl chloride—7791-25-5—100 %—>480 min—<0.1—ASTM F 739
 Titanium tetrachloride—7550-45-0—100 %—>480 min—<0.1—ASTM F 739
 Tungsten hexafluoride—7783-83-6—100 % gas—>480 min—<0.026—ASTM F 739

Ensemble Application: IDLH environments or atmosphere with less than 19.5 % oxygen concentration is respirator dependent. Radiation protection against radioactive particles, not ionizing neutrons, gamma-rays, or x-ray radiation. Deep frozen media depends on additional thermal protection of hands. Biological and liquefied gas conditions.

Flame Resistance: Certified to NFPA 1991 assuming both the aluminized over cover and chemical protective inner suit are worn, as well as any other necessary protection such as respirators, boots, etc.

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 8.88 kg (19.58 lb)

Ensemble weight (plus components): 11.63 kg (25.63 lb)*

* weight consists of suit with Ongaard Hazmax Boots, size 11, with no pass-throughs

Unit area weight of material used: 251 g/m² (10.6 oz/yd²) **

Material thickness of the ensemble: 660 μ (26 mil)**

** unit weight and thickness apply to garment material only

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted. Test subject was able to complete all tasks as specified in the standard.

Construction: The garment is constructed with double-taped seams to provide barrier against liquids, aerosols and vapors, and to increase durability. It has an extra wide three-layer face shield (PVC 40 mil / Teflon® 5 mil / PVC 20 mil), three-layer glove system (Neoprene / EVOH film / Kevlar® knit), expanded back (accommodates SCBA), front entry, gas-tight zipper closure, double storm flap over zipper, attached boots, outer boot flaps, knee wear pads, four exhaust valves, internal adjustment belt. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.

Colors: Aluminized—Please contact customer service for special product applications. The ensemble is high-visibility lime-yellow in color.

Dexterity: <600 %—based on results of NFPA certification test

Visual Acuity/Visibility: Visual acuity is better than or equal to 20/35

FOV: Field of view greater than or equal to 70 % of natural field of view. Comments (i.e., size and shape of face shield)—extra wide face shield made of 3 layers: PVC 40 mil/Teflon® 5 mil/PVC 20 mil. The face shield consists of about 70 % of the hood, allowing almost peripheral viewing, even with an SCBA facemask on. Since the wearer can (and should) turn their head to view, the user has almost 180° of visibility. Anti-fog towelettes are included with ensemble to minimize fogging of the inner layer.

Don/Doff: Assistance is required for donning and doffing. 60 s—varies with practice, skill, and whether assistance is provided.

Operational Limitations: Users should use WBGT method for heat stress environmental modeling and a clothing correction factor of 10 °C (50 °F) for hooded coveralls and higher for encapsulated ensembles. Working in hot, humid environments depends on level of work activity, rest/work cycle, health of the individual, as well as temperature, humidity, wind speed, and radiant heating.

MCC Capability: Ensemble has the ability to be used with a microclimate cooling system. User must specify pass-throughs prior to garment manufacturing.

Environmental Conditions: Ensemble has met the cold temperature performance test. Glove has met independent cold temperature performance tests and exceeds standard's requirements.

LOGISTICS/TRAINING

TDP: Technical data package is included with all NFPA certified garments. For additional copies, please call customer service at 800-931-3456.

Training:

- **Training Hours:** Level of training on Tychem® garments depends on prior qualifications and training of end user. A HazMat technician requires less product-specific training than a novice user. Training documentation is available from the manufacturer.
- **Training Required:** Level of training on Tychem® garments depends on prior qualification and training of end-user. A HazMat technician requires less product specific training than a novice user.
- **Training Available:** Name of training course—Last Line of Defense. Training does not result in certification.
- **Manuals Available:** Technical data package and permeation guide available with each suit. User manuals are included with all NFPA certified suits and all Level A suits. For additional copies, please visit our website at: www.personalprotection.dupont.com, or call customer service at 800-931-3456.

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused. See user's manual.

Cleaning Products: Garments should be clean and dry before use. Water and mild, household dishwashing liquid should be used to clean these garments. These garments may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water, and air-dried. Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. Do not dry clean these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach.

Use/Reuse: Discard if contaminated. Disposal per jurisdictional regulations.

Shelf Life: 6 yr to 10 yr—DuPont™ suggests Tychem® chemical garments can be used as long as they pass a visual inspection test, and in the case of Level A garments, the ASTM F1052 inflation test. Tychem® chemical garments do not have a fixed shelf life. DuPont™ suggests retiring garments to “Training Use Only” 5 yr after date of receipt. See storage life statement at www.personalprotection.com.

Maintenance Required: All PPE should be inspected prior to each use, refer to 29 CFR 1910, Subpart I, Personal Protective Equipment Standards for General Industry. See the DuPont™ Personal Protection (DPP) user manual for specific instructions (extra copies are available online at www.personalprotection.dupont.com). Maintenance frequency is before and after each use and at least annually.

Maintenance Cost: Not specified

Storage Conditions: Temperature range: <49 °C (<120 °F). Relative humidity range: 0 % to 100 %. Preferably, garments should be stored in a cool, dark, dry location, free of dirt and insects. Sunlight, ozone, high temperatures >49 °C (>120 °F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers. Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Consumables: Not applicable

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. 4X and 5X are available.

SPECIAL PARAMETERS

Health Hazards: If the garment has elastic wrists, ankles and/or an elastic hood opening, the elastic may contain natural rubber latex

Latex/Allergens: Garment does not contain latex; Garments are considered “articles” and are exempt from MSDS reporting requirements. The garments are nonhazardous.

Communications: Ensemble has the ability to interface with a communications system. There is a minimum order requirement for NFPA 1991 and 1994 Class 1 ensembles for certification of pass-through.

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: DuPont makes no guarantee of results and assumes no obligation or liability in connection with the use of DuPont garments and accessories. It is the user’s responsibility to determine the level of hazards and the proper personal protective equipment needed. DuPont warrants to the purchaser/end user only for a period of 90 d from date the garment or accessory was shipped to the purchaser/end user or, for a period of 12 mo from the date the encapsulated garment was shipped to the purchaser/end user that the garment and accessory, if any, are free of defects in materials and workmanship. Since conditions of use are outside DuPont’s control, DuPont makes no other warranties of any kind, expressed or implied, including, without limitation, no warranties of merchantability or fitness for a particular use and assumes no liability in connection with any use of the DuPont garment and accessories. This warranty is void in the event any party including purchaser/end user modifies the garment or accessory in any way. The sole and exclusive remedy for all purchasers and/or end users for any and all claims, losses, injuries or damages of any kind relating to or arising from DuPont garments and accessories, shall be the refund of the purchase price or the replacement or repair of any garment or accessory found to contain a defect in materials or workmanship upon inspection by DuPont. Only DuPont shall determine the form of remedy (repair, replacement, or refund) for items containing a defect in materials or workmanship. No warranty claim shall be honored unless received by DuPont within 90 d of the date the garment or accessory was shipped to the purchaser and/or end user or, within 12 mo from the date the encapsulated garment was shipped to the purchaser/end user. In no event shall DuPont be liable for any special, incidental, indirect, punitive or consequential damages, whether arising from contract, tort, warranty, representation, instruction, design or manufacturing defects, or any other cause or theory. Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user’s responsibility to determine the level of risk and the proper protective equipment needed for the user’s particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent right.

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GENERAL

Tychem® TK, Rear Entry Level A Garment, Certified to NFPA 1991**Model:** TK601T**Stock:** TK601T (rear entry)

DuPont Personal Protection
 5401 Jefferson Davis Highway
 Richmond, Virginia 23234
 Customer Service
 800-931-3456 (Tel)
 843-335-8599 (Fax)
 personalprotection@usa.dupont.com

Manufacturer Type: Domestic**Information Source:** <http://www.personalprotection.com>
Responder Knowledge Database (RKB)**Status:** The vendor has responded—6/6/2005

NFPA Certification:
 NFPA 1991, 2005 Edition

OSHA EPA Level:
 Level A

NFPA Certification Number:
 VPS-DUP-02

Certifying Organization:
 SEI

Date Certified/Expected:
 February 2, 2005
 Intertek—Annual reverifications

Required Boots:

Onguard Industries—Hazmax (87012) boots not included.
 Boot must be worn over the integrated bootie for compliance to NFPA 1991 (2005 Edition).

Required Gloves:

Attached glove system:
 Outer glove: Ansell Edmont #k2300-12 Kevlar®
 Middle glove: Guardian #IN-35
 Neoprene inner glove: Ansell Barrier® Style 2-100

Respiratory Equipment: SCBA must be certified to NFPA 1981 (sold separately)**Unit Cost:** \$1.5K**Availability:** In stock. If not in stock, standard lead time is 4 wk to 6 wk.**References:** Used by numerous Hazmat teams and Federal 1st Responders**Other Certifications:** Not applicable**Independent Testing:** Not applicable**Material Technology:** The certified Tychem® TK ensemble provides an extremely durable material and boasts one of the broadest ranges of chemical protection available, successfully tested against more than 260 chemicals with no observed permeation after 8 h of continuous contact.

Tychem® TK—a patented limited-use fabric consisting of multiple nonpermeable barrier films laminated to both sides of a tough substrate material. Seams are sewn and sealed with hot air welded tape. The gloves are attached to the sleeve by an inverted, rigid ring and clamp system. The garment has an attached sock with boot-top covers. A user-supplied boot must be worn over the attached sock with the boot-top covers pulled down over the upper portion of the boot to prevent liquid pooling inside the boot. Outersuit: Aluminized Fiberglass Gentex Fabric: Marc Mac Construction Products p/n 65160X, 65161X; and National Safety Apparel C83FF and C87FF.

Permeation and physical property data are available online at: www.personalprotection.dupont.com or you can request a copy from customer service at 800-931-3456.

Design/Configuration: Suit is adjustable to accommodate various body types. Rear entry.

Ensemble Design and Description: The garment is constructed with double-taped seams to provide barrier against liquids, aerosols, and vapors and increase durability. It has an extra wide three-layer face shield (PVC 40 mil/Teflon® 5 mil/PVC 20 mil), three-layer glove system (Neoprene/EVOH film/Kevlar® knit), expanded back (accommodates SCBA), front entry, gas-tight zipper closure, double storm flap over zipper, attached boots, outer boot flaps, knee wear pads, four exhaust valves, and internal adjustment belt. The ensemble is high-visibility lime-yellow in color. This ensemble is certified to the NFPA 1991, 2005 Edition.

1. The rear entry ensemble shall include a suit, which shall be constructed from a multiple-layer, film-based composite material. The overcover shall be constructed from a woven fiberglass substrate with an aluminized Mylar reflective film.

2. The material, seams, visor, and gloves shall demonstrate no measurable chemical permeation for a period of 1 h when tested against the 15 recommended liquid test chemicals and the six recommended gaseous test chemicals listed in the NFPA 1991 (2000 Edition). In addition to the NFPA test data, the manufacturer shall be able to provide chemical permeation data results against the base fabric for at least 200 chemicals.
3. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.
4. The suit shall be constructed with an airtight zipper. The zipper shall be covered by a double overlapping storm flap made of the base fabric.
5. The glove system shall consist of: a Neoprene Ansell Barrier® inner glove, a Guardian #IN-35 middle glove, and an Ansell Edmont #k2300-12 Kevlar® outer glove. The gloves shall be field replaceable by means of an internal ring and clamp system. The interface between the glove and sleeve shall form an airtight seal.
6. The view window in the inner suit shall be a three layer face shield made of 40 mil polished PVC/5 mil Teflon® FEP/20 mil polished PVC. The overcover shall be constructed with a view window of 20 mil Lexan®. The suit and overcover will have an EX (extra wide) face shield.
7. The inner garment shall have four pressure demand exhalation valves. The valves shall be covered by splash guards of the base material. The overcover shall have four pressure demand exhalation valves, covered by splash guards.
8. The suit shall be constructed with sock boots made from the base material to allow the use of a replaceable overboot. The boot area shall be covered by a splash guard. The overcover ankles are finished with elastic. (Note: An NFPA certified boot must be worn with the suit ensemble in order to meet NFPA certification.)
9. The suit shall contain an internal waist belt system for support and improved fit.
10. The suit shall be designed to accommodate a SCBA and shall allow for the use of an ANSI certified hard hat.
11. Each unit of the ensemble shall have a unique serial number. The suit shall be tested for airtight integrity prior to delivery. This test shall be conducted using positive air pressure as specified in ASTM F1052.
12. The suit shall be capable of being field tested for airtight integrity using an optional positive pressure test kit (style No. 990810).
13. The ensemble shall meet the base requirements set forth in NFPA 1991 Vapor-Protective Suits for Hazardous Chemical Emergencies (2000 Edition) and the optional liquefied gas and CB terrorism protection requirements. The ensemble shall be certified as such by the SEI.
14. The ensemble shall have proper labeling which states NFPA 1991 Certification and includes the SEI logo.

Required Elements: Attached bootie worn with outer boot and replaceable attached gloves

Aluminized over cover

Respiratory equipment—the ensemble has the ability to accommodate pass-through(s) for respirators

Number of pass-throughs—up to 3

Pass-through options:

ISI Pass-Through

Draeger with Hansen Fitting Pass-Through

Draeger with Foster Fitting Pass-Through

Interspiro Pass-Through

Scott with Hansen Fitting Pass-Through

Scott with Schrader Fitting Pass-Through

Survivair® with Foster Fitting Pass-Through

Survivair® with Hansen Fitting Pass-Through

Survivair® with Schrader Fitting Pass-Through

MSA Dual Purpose with Foster Fitting Pass-Through

MSA Dual Purpose with Hansen Fitting Pass-Through

MSA with Schrader Fitting Pass-Through

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 1 and 1991 CB option plus additional CA protection

BAs Protected Against: Exceeds NFPA 1994 liquid penetration and liquid biological threat protection

TIMs Protected Against: Meets 1994, 1991, and 1992 plus additional chemical threats

Rad/Nuc Materials Protected Against: Yes

Duration of Protection: Between 60 min and 119 min. Duration controlled by heat stress and respirator capability.

Acetone cyanohydrin—75-86-5—100 %—>480 min—<0.01—ASTM F 739

Acrolein—107-02-8—100 %—>480 min—<0.02—ASTM F 739

Acrylonitrile—107-13-1—100 %—>480 min—<0.001—ASTM F 739

Allyl alcohol—107-18-6—100 %—>480v—<0.1—ASTM F 739

Ammonia—7664-41-7—100 % gas—>480 min—<0.1—ASTM F 739
 Arsine—7784-42-1—100 % gas—>480 min—<0.01—ASTM F 739
 Boron trichloride—10294-34-5—100 % gas—>480 min—<0.02—ASTM F 739
 Boron trifluoride—7637-07-02—100 % gas—>480 min—<0.1—ASTM F 739
 Carbon disulfide—75-15-0—100 %—>480 min—<0.02—ASTM F 739
 Carbon monoxide—630-08-0—100 % gas—330 min—0.1—ASTM F 739
 Chlorine—7782-50-5—100 % gas—>480 min—<0.02—ASTM F 739
 Chlorosulfonic acid—7790-94-5—100 %—>480 min—<0.1—ASTM F 739
 Diborane—19287-45-7—10 % (gas)—>480 min—<0.005—ASTM F 739
 Dimethylhydrazine—57-14-7—100 %—>480 min—<5.0—ASTM F 739
 Ethylene dibromide—106-93-4—100 %—>480 min—<0.1—ASTM F 739
 Ethylene oxide—75-21-8—100 % gas—>480 min—<0.1—ASTM F 739
 Fluorine—7782-41-4—100 % gas—>480 min—<0.002—ASTM F 739
 Formaldehyde (37 %)—50-00-0—100 %—>480 min—<0.09—ASTM F 739
 Hydrogen bromide—10035-10-6—100 % gas—>480 min—<0.1—ASTM F 739
 Hydrogen chloride—7647-01-0—100 % gas—>480 min—<0.1—ASTM F 739
 Hydrogen cyanide—74-90-8—100 % gas—>480 min—<0.01—ASTM F 739
 Hydrogen fluoride—7664-39-3—100 % gas—>480 min—<0.1—ASTM F 739
 Hydrogen selenide—7783-07-5—100 % gas—>480 min—<0.01—ASTM F 739
 Hydrogen sulfide—7783-06-4—100 % gas—>480 min—<0.01—ASTM F 739
 Methanesulfonyl chloride—124-63-0—100 %—>480 min—<0.0006—ASTM F 739
 Methyl chloroformate—79-22-1—100 %—>480 min—<0.01—ASTM F 739
 Methyl hydrazine—60-34-4—100 %—>480 min—<0.01—ASTM F 739
 Methyl isocyanate—624-83-9—100 %—>480 min—<0.013—ASTM F 739
 Methyl mercaptan—74-93-1—100 % gas—>480 min—<0.001—ASTM F 739
 Nitric acid, fuming—7697-37-2—100 %—>480 min—<0.033—ASTM F 739
 Phosgene—75-44-5—100 % gas—>480 min—<0.1—ASTM F 739
 Phosphine—7803-51-2—100 % gas—>480 min—<0.01—ASTM F 739
 Phosphorous trichloride—7719-12-2—100 %—>480 min—<0.1—ASTM F 739
 Sulfur dioxide—7449-09-05—100 % gas—>480 min—<0.01—ASTM F 739
 Sulfur trioxide—7449-11-9—100 %—90 min—696—ASTM F 739
 Sulfuric acid, concentrated—7664-93-9—95–98 %—>480 min—<0.1—ASTM F 739
 Sulfuryl chloride—7791-25-5—100 %—>480 min—<0.1—ASTM F 739
 Titanium tetrachloride—7550-45-0—100 %—>480 min—<0.1—ASTM F 739
 Tungsten hexafluoride—7783-83-6—100 % gas—>480 min—<0.026—ASTM F 739

Ensemble Application: IDLH environments or atmosphere with less than 19.5 % oxygen concentration is respirator dependent. Radiation protection against radioactive particles, not ionizing neutrons, gamma-rays, or x-ray radiation. Deep frozen media depends on additional thermal protection of hands. Biological and liquefied gas conditions.

Flame Resistance: Certified to NFPA 1991 assuming both the aluminized over cover and chemical protective inner suit are worn, as well as any other necessary protection such as respirators, boots, etc.

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 8.9 kg (19.58 lb)

Ensemble weight (plus components): 11.6 kg (25.63 lb)*

* weight consists of suit with Onguard Hazmax Boots, size 11, with no pass-throughs

Unit area weight of material used: 251 g/m² (10.6 oz/yd²) **

Material thickness of the ensemble: 660 μ (26 mil)**

** unit weight and thickness apply to garment material only

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted. Test subject was able to complete all tasks as specified in the standard.

Construction: The garment is constructed with double-taped seams to provide barrier against liquids, aerosols and vapors, and increase durability. It has an extra wide three-layer face shield (PVC 40 mil / Teflon® 5 mil / PVC 20 mil), three-layer glove system (Neoprene / EVOH film / Kevlar® knit), expanded back (accommodates SCBA), front entry, gas-tight zipper closure, double storm flap over zipper, attached boots, outer boot flaps, knee wear pads, four exhaust valves, and internal adjustment belt. All seams in the suit shall be stitched with nylon thread and covered with heat-sealed tape on the inside and outside of the suit. The tape used to cover the seams shall be a film composite with equal to or greater barrier than the base fabric.

Colors: Aluminized—Please contact customer service for special product applications

Dexterity: <600 %—based on results of NFPA certification test

Visual Acuity/Visibility: Visual acuity is better than or equal to 20/35

FOV: Field of view greater than or equal to 70% of natural field of view. Comments (i.e., size and shape of face shield)—extra wide face shield made of 3 layers: PVC 40 mil/Teflon® 5 mil/PVC 20 mil. The face shield consists of about 70 % of the hood, allowing almost peripheral viewing, even with an SCBA facemask on. Since the wearer can (and should) turn their head to view, the user has almost 180° of visibility. Anti-fog towelettes are included with ensemble to minimize fogging of the inner layer.

Don/Doff: Assistance is required for donning and doffing. 60 s—varies with practice, skill, and whether assistance is provided.

Operational Limitations: Users should use WBGT method for heat stress environmental modeling and a clothing correction factor of 10 °C (50 °F) for hooded coveralls and higher for encapsulated ensembles. Working in hot, humid environments depends on level of work activity, rest/work cycle, health of the individual, as well as temperature, humidity, wind speed, and radiant heating.

MCC Capability: Ensemble has the ability to be used with a microclimate cooling system. User must specify pass-throughs prior to garment manufacturing.

Environmental Conditions: Ensemble has met the cold temperature performance test. Glove has met independent cold temperature performance tests and exceeds the standard's requirements.

LOGISTICS/TRAINING

TDP: Technical data package is included with all NFPA certified garments. For additional copies, please call customer service at 800-931-3456.

Training:

- **Training Hours:** Level of training on Tychem® garments depends on prior qualifications and training of end user. A HazMat technician requires less product-specific training than a novice user. Training documentation is available from the manufacturer.
- **Training Required:** Level of training on Tychem® garments depends on prior qualification and training of end-user. A HazMat technician requires less product specific training than a novice user.
- **Training Available:** Name of training course—Last Line of Defense. Training does not result in certification.
- **Manuals Available:** Technical data package and permeation guide available with each suit. User manuals are included with all NFPA certified suits and all Level A suits. For additional copies, please visit our website at: www.personalprotection.dupont.com, or call customer service at 800-931-3456.

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused. See user's manual.

Cleaning Products: Garments should be clean and dry before use. Water and mild, household dishwashing liquid should be used to clean these garments. These garments may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water, and air-dried. Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. Do not dry clean these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach.

Use/Reuse: Discard if contaminated. Disposal per jurisdictional regulations.

Shelf Life: 6 yr to 10 yr—DuPont™ suggests Tychem® chemical garments can be used as long as they pass a visual inspection test, and in the case of Level A garments, the ASTM F1052 inflation test. Tychem® chemical garments do not have a fixed shelf life. DuPont™ suggests retiring garments to “Training Use Only” 5 yr after date of receipt. See storage life statement at www.personalprotection.com.

Maintenance Required: All PPE should be inspected prior to each use, refer to 29 CFR 1910, Subpart I, Personal Protective Equipment Standards for General Industry. See the DuPont™ Personal Protection (DPP) user manual for specific instructions (extra copies are available online at www.personalprotection.dupont.com). Maintenance frequency is before and after each use and at least annually.

Maintenance Cost: Not specified

Storage Conditions: Temperature range: <49 °C (<120 °F). Relative humidity range: 0 % to 100 %. Preferably, garments should be stored in a cool, dark, dry location, free of dirt and insects. Sunlight, ozone, high temperatures >49 °C (>120 °F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers. Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Consumables: Not applicable

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. 4X and 5X are available.

SPECIAL PARAMETERS

Health Hazards: If the garment has elastic wrists, ankles and/or an elastic hood opening, the elastic may contain natural rubber latex

Latex/Allergens: Garment does not contain latex; Garments are considered “articles” and are exempt from MSDS reporting requirements. The garments are nonhazardous.

Communications: Ensemble has the ability to interface with a communications system. There is a minimum order requirement for NFPA 1991 and 1994 Class 1 ensembles for certification of pass-through.

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: DuPont makes no guarantee of results and assumes no obligation or liability in connection with the use of DuPont garments and accessories. It is the user’s responsibility to determine the level of hazards and the proper personal protective equipment needed. DuPont warrants to the purchaser/end user only for a period of 90 d from date the garment or accessory was shipped to the purchaser/end user or, for a period of 12 mo from the date the encapsulated garment was shipped to the purchaser/end user that the garment and accessory, if any, are free of defects in materials and workmanship. Since conditions of use are outside DuPont’s control, DuPont makes no other warranties of any kind, expressed or implied, including, without limitation, no warranties of merchantability or fitness for a particular use and assumes no liability in connection with any use of the DuPont garment and accessories. This warranty is void in the event any party including purchaser/end user modifies the garment or accessory in any way. The sole and exclusive remedy for all purchasers and/or end users for any and all claims, losses, injuries or damages of any kind relating to or arising from DuPont garments and accessories, shall be the refund of the purchase price or the replacement or repair of any garment or accessory found to contain a defect in materials or workmanship upon inspection by DuPont. Only DuPont shall determine the form of remedy (repair, replacement, or refund) for items containing a defect in materials or workmanship. No warranty claim shall be honored unless received by DuPont within 90 d of the date the garment or accessory was shipped to the purchaser and/or end user or, within 12 mo from the date the encapsulated garment was shipped to the purchaser/end user. In no event shall DuPont be liable for any special, incidental, indirect, punitive or consequential damages, whether arising from contract, tort, warranty, representation, instruction, design or manufacturing defects, or any other cause or theory. Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user’s responsibility to determine the level of risk and the proper protective equipment needed for the user’s particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent right.

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GENERAL

Lakeland Tychem TK NFPA 1991, 2000 Edition Ensemble**Model:** TK645, TK645W, TK655, TK655W**Stock:** TK645 (front entry), TK645W (front entry, wide view face shield) TK655 (rear-entry, aluminized fiberglass overcover), TK655W (rear entry, wide view face shield)

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Athena, Technical Support
 800-645-9291 (Tel)
 256-350-3011 (Fax)
 kendrab@lakeland-ind.com

Manufacturer Type: Domestic**Information Source:** <http://www.lakeland.com>

NIJ Guide for Personal Protection Equipment for Emergency First Responders. April 2001

Distributor:

Federal Resources, Inc.

www.federalresources.com

Robbie McWilliams

Robbie.FedResources@starband.net

410-643-7810 (Tel)

410-643-7701 (Fax)

Status: The vendor has responded—10/17/2006**NFPA Certification:**

NFPA 1991, 2000 Edition

OSHA EPA Level:

Level A

NFPA Certification Number:

MH28014

Certifying Organization:

UL

Date Certified/Expected:

Certified in 2004

Required Boots:

Not specified

Required Gloves:

The gloves shall be a 3-layer combination consisting of Viton, North Silvershield, and Kevlar knit. The glove system shall be field-replaceable by means of an internal ring and clamp system. A Kevlar knit glove shall be the standard outer glove. The interface between the glove and sleeve end shall form a gas-tight seal. A Quick-Disconnect glove assembly (option G7) is available for purchase and certified to the NFPA 1991 (2000 Edition) standard.

Respiratory Equipment: Not specified**Unit Cost:** \$1.35K**Availability:** 4 wk to 5 wk lead time**References:** Government organizations, municipal Hazmat teams, fire departments, international HAZMAT/military organizations, and industry**Other Certifications:** Consult DuPont Permeation Guide for certification and/or testing organizations. Nerve agent (GA, GB, GD, and VX) and blister agent (HD and L) testing.**Independent Testing:** Consult DuPont Permeation Guide for certification/testing organizations. ASTM F739 permeation testing. Each suit shall have a unique serial number and shall be tested for pressure integrity prior to delivery. This test shall be conducted using positive air pressure as specified in ASTM F1052.**Material Technology:** Inner garment is selectively permeable, outer garment is aluminized and made for abrasion resistance. Seams are sewn and heat-sealed with tape. The Level A under-suit material shall be constructed from Dupont Tychem TK.Basis weight (ASTM D3776-85): 10.6 oz/yd²

Breaking strength-grab (ASTM D5034-90)(MD/XD) 188/180 lb

Seam strength (ASTM D751) 106.0 lbf/in²

Tearing strength-trapezoid (ASTM D5733)(MD/XD) 53/52 lb

Thickness (ASTM D1777-64): 26 mil

Design/Configuration: Suit adjustability to accommodate bulky equipment. Pass-through options. Size-specific and front or rear entry design.

Ensemble Design and Description: Fully encapsulated vapor-protective suit, expanded back or flat back, sealed seams inside and out, 122 cm (48 in) gas tight zipper, double storm flap with hook and loop closure, 2-layer face shield (10 mil Teflon/40 mil pvc) standard or wide view lens, 3 layer glove combination of Viton, Silver Shield, and outer knit Kevlar, 3 exhaust valves, attached sock boots with boot flaps, 3.8 cm (1.5 in) waist belt with 3 belt loops sewn and sealed. Includes aluminized fiberglass overcover. Storage bag and Ongaard Hazmax boots included. 10 mil Teflon overlay heat-sealed to 40 mil pvc visor. Eliminates moisture buildup between the two layers.

Required Elements: Attached bootie worn with outer boot and replaceable attached gloves, respiratory equipment, and certified pass-throughs. There shall be three covered exhalation valves located on the suit.

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 1 and 1991 with CB optional permeation resistance

BAs Protected Against: Exceeds NFPA 1994 liquid penetration and liquid biological threat protection

TIMs Protected Against: Meets 1994 plus 1991/1992 ASTM F 1001 battery of 21 chemicals. Meets NFPA 1994 Class 1 liquid/gases permeation resistance requirements.

Duration of Protection: Between 60 min and 119 min

Not specified

Ensemble Application: Tactical operations, HAZMAT teams, chemical/biological testing, training, and warfare environments

Flame Resistance: No

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 6.8 kg (15 lb)

Ensemble weight (plus components): 13.6 kg (30 lb)

Unit area weight of material used: 251 g/m² (10.6 oz/yd²)

Material thickness of the ensemble: 660 μ (26 mils)

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted for the ensemble

Construction: Heat-sealed seams. 10 mil Teflon overlay heat-sealed to 40 mil pvc visor. Eliminates moisture buildup between the two layers. All seams shall be stitched with nylon thread and covered with heat-sealed seam tape. The tape used to cover the seams shall be of similar composition as the film used in the base fabric and offer the same chemical resistance as the fabric. All seams shall be sealed inside and out.

Colors: Outer garment is silver, inner is lime-green

Dexterity: Not specified

Visual Acuity/Visibility: Visual acuity better than or equal to 20/35

FOV: Field of View: at least 70 %. Garments are available with extra wide face shield.

Don/Doff: Assistance is needed for donning and/or doffing. Average donning time is less than 60 s.

Operational Limitations: The maximum time a garment can be worn depends on such variables as the air supply, ambient condition, climate inside the ensemble, physical and psychological condition of the wearer, work rate, and work load. The Tychem TK fabric has a temperature service range of -70 °C (-94 °F) to 90 °C (194 °F).

MCC Capability: Ensemble does not have the ability to be used with a microclimate cooling system

Environmental Conditions: The ensemble has met the cold temperature performance test. The glove has met independent cold temperature performance tests.

LOGISTICS/TRAINING

TDP: Technical data package is available. User and instruction manuals are included in shipment and available on line.

Training:

- **Training Hours:** Less than 8 h not provided by the manufacturer. Training documentation is not available from the manufacturer.
- **Training Required:** Less than 8 h
- **Training Available:** Manual and CD available
- **Manuals Available:** Instruction manual

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused. If not contaminated garment needs to pass visual inspection before reuse.

Cleaning Products: Use mild detergent and water

Use/Reuse: Decontamination/disposal procedures are available

Shelf Life: 1 yr to 5 yr

Maintenance Required: Before and after each use, upon receipt from manufacturer and annually. Visually inspect prior to use for holes or tears. The suit manufacturer must have a team of emergency personnel on call 24/7, 365 d a year in the event of an emergency requiring technical product information, stock status, or emergency product shipment.

Maintenance Cost: Not specified

Storage Conditions: Temperature: 16 °C to 29 °C (60 °F to 85 °F). Relative humidity: <78 %. Suit should be stored flat with zipper open. Each suit must be packaged in a reusable storage bag with carrying handles. Bags should have a zipper closure.

Consumables: 3-layer glove system, a combination of Viton (middle), and North Silver Shield (inner), and Kevlar (outer), storage bag, and Onguard HAZMAX boots included with each ensemble, and a Level A pressure test kit

Consumables Costs: None

Package Shape/Size (Storage): Cube—Less than or equal to 0.113 m³ (4.0 ft³)

Sizes Available: Small, medium, large, X-large, 2X-large, 3X-large, 4X-large, and 5X-large

SPECIAL PARAMETERS

Health Hazards: Ensemble contains latex

Latex/Allergens: Elastic may contain latex; MSDS is available

Communications: Ensemble has the ability to interface with a communications system

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: 90 d warranty

GENERAL

Trellechem® HPS Type T/TE**Model:** HPS**Stock:** Medium (477520046), Large (477520047), X-Large (477520048), XX-Large (477520049)

Trelleborg Viking, Inc.
 170 West Road, Suite 1
 Portsmouth, New Hampshire 03801
 Tim Flaherty
 Chuck Cooper
 800-344-4458 (Tel)
 603-436-1236 (Tel)
 603-436-1392 (Fax)
 tvi.usa@trelleborg.com

Manufacturer Type: Foreign—Trelleborg Industries, Ystad
 Sweden

Information Source: <http://www.trelleborg.com/protective/>
 National Institution of Justice (NIJ) Guide for Personal
 Protection Equipment for Emergency First Responders, April
 2001

Responder Knowledge Database (RKB)

Status: The vendor has responded—5/20/2005

**NFPA Certification:**

NFPA 1991, 2005 Edition

OSHA EPA Level:

Level A

NFPA Certification Number:

VPS-TRE-01

Certifying Organization:

SEI

Date Certified/Expected:

June 2005

Required Boots:

Onguard Industries—Hazmax (87012) boots (sold separately
 from an authorized Onguard dealer)

Required Gloves:

Over glove—Kevlar® glove (KV18AJTC)—Perfect Fit
 Glove Company
 Outer glove—Chloroprene rubber glove, 35A (072-251-
 000)—Guardian Manufacturing
 Inner barrier layer—Silver Shield® 4H® (072-251-100)—
 North Safety Products

Respiratory Equipment: SCBA must be CBRN certified by NIOSH and certified as compliant to NFPA 1981 (sold
 separately)

Unit Cost: \$4.65K

Availability: Stocked item—30 d or less lead time

References: Not specified

Other Certifications: Five third-party certifications between 7/1/2000 and 5/10/2005 and NFPA 1994 Class 1 in September
 2005

Independent Testing: TNO Netherlands CAs (GB, GD, HD, GA, VX, L, AS, and CG. Test date 2003.

Material Technology: Polyamide fabric coated on the outside with butyl rubber and an additional top layer of Viton®. Inside
 coated with chloroprene rubber and a polymer barrier laminate.

Visor material—2 mm (0.079 in) high impact PVC.

Footwear material—silicone-coated oversocks.

Glove material—multilayer silver colored polymer laminate film inner layer and a chloroprene rubber outer layer.

Zipper—Dynat SD sipper, chain of a copper zinc, nickel alloy (white copper); tape is made of chloroprene rubber coated; free
 edge held in place by Velcro.

Design/Configuration: Internal structural support—fabric substrate. Pass-through options. Point of entry—front or rear entry
 design. Ensemble is size specific and conforms to the body. Attached gloves (replaceable) are multi-layer (inner barrier, outer
 rubber, and Kevlar over). Attached bootie is worn with outer boot.

Ensemble Design and Description: Ensemble is designed by a tailor for comfort and fit. Each ensemble delivery includes one
 separate pair of thin inner comfort gloves made of cotton. The ensemble is delivered with a pair of silicone-coated oversocks to
 ease the donning of the safety boots. Ensemble has integrated socks/booties in the garment material. Also, a pair of silicone-

coated oversocks is supplied with the suit. The standard glove assembly consists of two layers. A pair of separate thin inner comfort gloves of cotton is supplied with the suit. The suit can be delivered with a semi-fixed attached Viton/butyl rubber gloves in combination with wrist cuffs for increased safety. Visor is extra large, made from impact resistant 2 mm PVC. Zipper is long heavy-duty gas-tight on the front left side for easy donning and doffing and closes downwards. Ensembles are equipped with an integrated possibility for ventilation. Four exhaust valves and an affixed ventilation system capable of circulating cooling air through the suit at either 2/30 L/min.

Required Elements: Integrated socks/booties. Alternatively, the suit is supplied with fixed safety boots.

Inner glove made of a silver colored barrier film laminate. Fixed by a “snap-on” arrangement for easy replacement. Outer glove made of a flame retardant chloroprene rubber. Semi-attached to the suit by an elastic band. NFPA certified versions come with a cut-resistant Kevlar® over glove. Alternatively, the suit can be delivered with semi-fixed attached Viton®/butyl rubber gloves in combination with wrist cuffs for increased safety. A pair of separate thin inner comfort gloves of cotton is always supplied with the suit.

Certified pass-through options (Interspiro, MSA, ISI, Dräger, Scott, and Survivair).

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991, 2005 Ed, plus additional CA protection. Chem/Bio certified 1991.

Mustard gas (HD) >24 h breakthrough

Lewisite (L) >24 h breakthrough

Tabun (GA) >24 h breakthrough

Sarin (GB) >24 h breakthrough

Soman (GD) >24 h breakthrough

VX >24 h breakthrough

Arsine (AS) >8 h breakthrough

Phosgene (CG) >8 h breakthrough

Cyanogen chloride (CK) >1 h breakthrough

BAs Protected Against: Exceeds NFPA 1994 by providing “systems level” aerosol threat protection. NFPA 1991 (2000 Edition) and Chem/Bio Option.

TIMs Protected Against: Meets 1994, 1991, and 1992 plus additional chemical threats

Rad/Nuc Materials Protected Against: Yes

Duration of Protection: Recommend 1 h, but suit material provides 8 h

Breakthrough time of most chemicals is >480 min

Ensemble Application: All Level A, in Zones 1 and 2. Fused munitions, IDLH environments or atmosphere with less than 19.5 % oxygen concentration, biological, and deep frozen media.

Flame Resistance: Material meets NFPA 1991 flame resistance requirements

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 5.72 kg (12.6 lb)

Ensemble weight (plus components): 8.39 kg (18.5 lb)

Unit area weight of material: 690 g/m² (29 oz/yd²)

Thickness of material: 0.5 mm

Comfort ASTM: An ASTM F 1154 qualitative evaluation has been conducted. It is NFPA 1991 compliant.

Construction: Butt seam stitched with an aramide thread. Outside covered with a Viton® rubber strip. Inside covered with a welded-on barrier film laminate strip.

Zipper: Long heavy duty gas-tight zipper protected by an external splash protective flap.

Colors: HPS is available in red and olive green—camouflage is not available

Dexterity: Dexterity performance reduction—206 %

Visual Acuity/Visibility: Visual acuity is 20/30. It is NFPA 1991 compliant.

FOV: FOV—80 %. Because visor is not fixed to head, the FOV can vary. Anti-fog lenses are available as an option.

Don/Doff: <60 s for assisted donning and/or doffing

Operational Limitations: Under any environmental conditions to -40 °C to 66 °C (-40 °F to 150 °F). Relative humidity—0 % to 100 %. Duration of operation limited by duration of air source. All suit ventilation systems are available.

MCC Capability: Ensemble has pass-throughs for microclimate cooling

Environmental Conditions: Ensemble has met the cold temperature performance test (Class 1 and 2: Cold Temperature Performance Test (ASTM D 747)

HPS—0.022 lbf machine direction and across

LOGISTICS/TRAINING

TDP: TDP comes with each suit

Training:

- **Training Hours:** Less than 8 h provided by the manufacturer. Training documentation is available from the manufacturer. Required training includes donning and doffing, maintenance, and testing and repair.
- **Training Required:** Donning and doffing, maintenance, and testing and repair.
- **Training Available:** Classroom/Online—Upon request
- Manual/CD/Video—Trellchem—Manual, CD, or video
- Training CD comes with each ensemble
- **Manuals Available:** User instructions with each ensemble

Cleanability: Ensemble is multiple use. It can be cleaned multiple times with brush (with mild soap and water).

Cleaning Products: Water and additional commercial detergents

Use/Reuse: Ensemble can be decontaminated depending on the chemical contamination

Shelf Life: Ensemble has a 6 yr to 10 yr shelf life

Maintenance Required: Inspect and pressure test after each use and annually. Lubricate zipper and store in cool environment.

Maintenance costs are \$0—provided suit is not used.

Maintenance Cost: \$0—provided suit is not used

Storage Conditions: 4 °C to 27 °C (40 °F to 80 °F). Relative humidity—0 % to 90 %. Keep away from direct sunlight.

Consumables: 4H/Silver Shield gloves—\$10

Rubber gloves—\$70

Suit bags, hangers, gloves, test kits, repair kits, CD ROM, and suit manual

Consumables Costs: 4H/Silver Shield gloves—\$10

Rubber glove—\$70

Package Shape/Size (Storage): Oblong—Less than or equal to 0.113 m³ (4.0 ft³); 77.5 cm x 58 cm x 22 cm (30.5 in x 23 in x 8.5 in)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large

SPECIAL PARAMETERS

Health Hazards: Ensemble does not contain allergens

Latex/Allergens: Ensemble does not contain latex; MSDS is not available

Communications: Ensemble has communication capability

EOD Compatibility: Depending on size, the ensemble has the ability to be used with an Explosive Ordnance Disposal (Protective Bomb Suit) protective system

Warranty: 3 yr against manufacturer defects

GENERAL

Tychem® ThermoPro**Model:** TP188T

DuPont Personal Protection
 5401 Jefferson Davis Highway
 Richmond, Virginia 23234
 Customer Service
 800-931-3456 (Tel)
 843-335-8599 (Fax)
 personalprotection@usa.dupont.com

Manufacturer Type: Domestic
Information Source: <http://www.personalprotection.com>
Status: The vendor has responded—6/2/2005



NFPA Certification:
 NFPA 1992, 2005 Edition

OSHA EPA Level:
 Level B

NFPA Certification Number:
 LPS-DUP-01

Certifying Organization:
 SEI

Date Certified/Expected:
 September 19, 2005
 Intertek—Annual reverifications

Required Boots:
 Onguard Industries—Hazmax (87012) boots not included

Required Gloves:
 To protect the hands from heat and flame, wear outer gloves suitable for thermal protection, such as those compliant with NFPA 1971 or NFPA 1951. For additional chemical protection, an intermediate chemical barrier glove, such as an Ansell Barrier® or North Silver Shield worn over an inner, cotton or knit Kevlar® glove, may be considered. Gloves not included.

Respiratory Equipment: Not specified

Unit Cost: \$432

Availability: In stock

References: Not specified

Other Certifications: NFPA 2112 (Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire)

Independent Testing: Not applicable

Material Technology: Tychem® ThermoPro—provides flash fire escape and liquid-chemical splash protection by combining the trusted chemical protection of Tychem® and thermal protection of Nomex® into a single layer garment. Seams are sewn and sealed with hot air welded tape. Permeation and physical property data are available online at:

www.personalprotection.dupont.com or you can request a copy from customer service at 800-931-3456.

Design/Configuration: Currently, this garment does not have a pass-through(s). Pass-throughs can be installed but first must be NFPA certified (minimum order required). Front entry and size specific.

Ensemble Design and Description: Hooded coverall, zipper front, elastic wrist and ankle. Tychem® ThermoPro is available in bright orange and in low visibility gray where discretion is preferred.

1. The garment shall be constructed of an innovative new fabric from DuPont that utilizes proprietary Tychem® chemical barrier technology combined with Nomex® thermal protective fabric technology.
2. The garment shall be constructed in a coverall design with attached, respirator fit, drawstring hood.
3. The garment shall have wrists with tunnelized elastic and hemmed ankles.
4. The garment shall have seams which are sewn with aramid thread.
5. The garment shall have seams which are sealed with tape welded on the outside of the garment seams.
6. The tape used to cover the seams shall be a film composite with equal or greater chemical resistance than the base fabric.
7. The 32-in zipper shall be constructed with metal teeth set in a web made of DuPont™ Nomex®.
8. The closure shall be covered by two flaps made of garment material. The outer storm flap is fastened with hook-and-loop material made from FR treated polyamide.

9. The hood drawstring is made from Nomex® and Kevlar® fiber.
10. The garment shall be bright orange or gray in color.
11. The garment shall be certified as compliant to the current edition of NFPA 2112 by an independent 3rd-party certification organization.
12. The garment shall be certified as compliant to the current edition of NFPA 1992 by an independent 3rd-party certification organization.

Required Elements: Footwear—Ensemble has hemmed ankle.

Respiratory equipment—Currently, this garment does not have a pass-through(s). Pass-throughs can be installed but first must be NFPA certified. Minimum order required.

To protect the hands from heat and flame, wear outer gloves suitable for thermal protection, such as those compliant with NFPA 1971 or NFPA 1951. For additional chemical protection, an intermediate chemical barrier glove, such as an Ansell Barrier® or North Silver Shield worn over an inner, cotton or knit Kevlar® glove, may be considered.

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 1 and 1991 CB option plus additional CA protection. TP188T does not have an attached glove.

BAs Protected Against: TP188T does not have an attached glove

TIMs Protected Against: Meets 1994, 1991, and 1992 plus additional chemical threats. TP188T does not have an attached glove.

Duration of Protection: Between 60 min and 119 min. Duration controlled by heat stress and respirator capability.

Acetone cyanohydrin—75-86-5—100 %—>480 min—0.05—ASTM F 739

Acrolein—107-02-8—100 %—63 min—0.41—ASTM F 739

Acrylonitrile—107-13-1—100 %—>480 min—<0.01—ASTM F 739

Allyl alcohol—107-18-6—100 %—>480 min—0.04—ASTM F 739

Ammonia—7664-41-7—100 % gas—>480 min—<0.01—ASTM F 739

Carbon disulfide—75-15-0—100 %—>480 min—<0.15—ASTM F 739

Chlorine—7782-50-5—100 % gas—>480 min—<0.025—ASTM F 739

Chlorosulfonic acid—7790-94-5—100 %—>480 min—0.0003—ASTM F 739

Ethylene dibromide—106-93-4—100 %—288 min—0.52—ASTM F 739

Ethylene oxide—75-21-8—100 % gas—>480 min—<0.01—ASTM F 739

Formaldehyde (37 %)—50-00-0—100 %—>480 min—<0.001—ASTM F 739

Hydrogen bromide—10035-10-6—100 % gas—>480 min—0.0001—ASTM F 739

Hydrogen chloride—7647-01-0—100 % gas—>480 min—<0.01—ASTM F 739

Hydrogen fluoride—7664-39-3—100 % gas—I mm—High—ASTM F 739

Methyl hydrazine—60-34-4—100 %—283 min—0.98—ASTM F 739

Methyl isocyanate—624-83-9—100 %—I mm—0.42—ASTM F 739

Methyl mercaptan—74-93-1—100 % gas—>480 min—0.05—ASTM F 739

Nitric acid, fuming—7697-37-2—100 %—14 min—>50—ASTM F 739

Nitrogen dioxide—10102-44-0—100 % gas—14 min—>0.2—ASTM F 739

Phosgene—75-44-5—100 % gas—>480 min—<0.02—ASTM F 739

Phosphine—7803-51-2—100 % gas—I mm—>0.11—ASTM F 739

Phosphorous trichloride—7719-12-2—100 %—>480 min—<0.003—ASTM F 739

Sulfur dioxide—7449-09-05—100 % gas—38 min—2—ASTM F 739

Sulfuric acid, concentrated—7664-93-9—95-98 %—>480 min—<0.01—ASTM F 739

Sulfuryl chloride—7791-25-5—100 %—>480 min—<0.01—ASTM F 739

Titanium tetrachloride—7550-45-0—100 %—>480 min—<0.0001—ASTM F 739

Ensemble Application: Flammable or flash fire environment. IDLH environments or atmosphere with less than 19.5 % oxygen concentration is respirator dependent. Radiation protection against radioactive particles, not ionizing neutrons, gamma-ray, or x-ray radiation. Deep frozen protection media depends on additional thermal protection of hands

Flame Resistance: Certified to NFPA 1992 and NFPA 2112

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 907 g (2 lb)

Ensemble weight (plus components): 3.65 kg (8.05 lb)*

* weight consists of suit with Onguard Hazmax Boots, size 11, with no pass-throughs

Unit area weight of material used: 192 g/m² (8.1 oz/yd²)**

Material thickness of the ensemble: 864 μ (34 mil)**

**unit weight and thickness apply to garment material only

Comfort ASTM: Test subject was able to complete all tasks as specified in the standard (ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity)

Construction: Seams are sewn and sealed with hot air welded tape. The garment shall have seams which are sewn with aramid thread. The garment shall have seams which are sealed with tape welded on the outside of the garment seams. The tape used to cover the seams shall be a film composite with equal or greater chemical resistance than the base fabric.

Colors: Bright orange or gray—Please contact customer service for special product applications

Dexterity: TP188T does not have an attached glove

Visual Acuity/Visibility: Attached respirator fit, drawstring hood. No visor.

FOV: Not applicable

Don/Doff: Assistance is not needed for donning and/or doffing. Average time is <60 s but varies with practice, skill, and whether assistance is provided.

Operational Limitations: Users should use WBGT method for heat stress environmental modeling and a clothing correction factor of 10 °C (50 °F) for hooded coveralls and higher for encapsulated ensembles. Working in hot, humid environments depends on level of work activity, rest/work cycle, health of the individual, as well as temperature, humidity, wind speed, and radiant heating.

MCC Capability: Ensemble has the ability to be used with microclimate cooling systems. Currently, this garment does not have a pass-through(s). Pass-throughs can be installed but first must be NFPA certified. Minimum order required.

Environmental Conditions: Ensemble has been tested against environmental performance measures. Measured results exceed standard's requirements. TP188T does not have an attached glove.

LOGISTICS/TRAINING

TDP: Technical data package is included with all NFPA certified garments. For additional copies, please call customer service at 800-931-3456.

Training:

- **Training Hours:** Level of training on Tychem® garments depends on prior qualifications and training of end user. A HazMat technician requires less product-specific training than a novice user. Training documentation available from the manufacturer. Contact customer service at 800-931-3456.
- **Training Required:** Training documentation available from the manufacturer. Contact customer service at 800-931-3456.
- **Training Available:** Training is available through manuals. Training does not result in certification.
- **Manuals Available:** User manuals are included with all NFPA certified suits and all Level A suits. For additional copies, please visit our website at: www.personalprotection.dupont.com, or call customer service at 800-931-3456.

Cleanability: Garments should be clean and dry before use. Water and mild, household dishwashing liquid should be used to clean these garments. These garments may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water, and air-dried.

Cleaning Products: Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. Do not dry-clean these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach.

Use/Reuse: Do not reuse if contaminated

Shelf Life: 6 yr to 10 yr—DuPont™ suggests Tychem® chemical garments can be used as long as they pass a visual inspection test, and in the case of Level A garments, the ASTM F1052 inflation test). Tychem® chemical garments do not have a fixed shelf life. DuPont™ suggests retiring garments to “Training Use Only” 5 yr after date of receipt. See storage life statement at www.personalprotection.com.

Maintenance Required: All PPE should be inspected prior to each use, refer to 29 CFR 1910, Subpart I, Personal Protective Equipment Standards for General Industry. See the DuPont™ Personal Protection (DPP) user manual for specific instructions. (Extra copies are available online at www.personalprotection.dupont.com). Maintenance frequency is before and after each use and at least annually.

Maintenance Cost: Not applicable

Storage Conditions: Temperature range: <49 °C (<120 °F). Relative humidity range: 0 % to 100 %. Preferably, garments should be stored in a cool, dark, dry location, free of dirt and insects. Sunlight, ozone, high temperatures >49 °C (>120 °F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers. Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Consumables: Not applicable

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: X-small, medium, large, X-large, XX-large, XXX-large. 4X-large, 5X-large and small are available by special order.

SPECIAL PARAMETERS

Health Hazards: If the garment has elastic wrists, ankles and/or an elastic hood opening, the elastic may contain natural rubber latex

Latex/Allergens: Garment contains latex; Garments are considered “articles” and are exempt from MSDS reporting requirements. The garments are nonhazardous.

Communications: Currently, this garment does not have a pass-through(s). Pass-throughs can be installed but first must be NFPA certified. Minimum order required.

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: DuPont makes no guarantee of results and assumes no obligation or liability in connection with the use of DuPont garments and accessories. It is the user’s responsibility to determine the level of hazards and the proper personal protective equipment needed. DuPont warrants to the purchaser/end user only for a period of 90 d from date the garment or accessory was shipped to the purchaser/end user or, for a period of 12 mo from the date the encapsulated garment was shipped to the purchaser/enduser that the garment and accessory, if any, are free of defects in materials and workmanship. Since conditions of use are outside DuPont’s control, DuPont makes no other warranties of any kind, expressed or implied, including, without limitation, no warranties of merchantability or fitness for a particular use and assumes no liability in connection with any use of the DuPont garment and accessories. This warranty is void in the event any party including purchaser/end user modifies the garment or accessory in any way. The sole and exclusive remedy for all purchasers and/or end users for any and all claims, losses, injuries or damages of any kind relating to or arising from DuPont garments and accessories, shall be the refund of the purchase price or the replacement or repair of any garment or accessory found to contain a defect in materials or workmanship upon inspection by DuPont. Only DuPont shall determine the form of remedy (repair, replacement, or refund) for items containing a defect in materials or workmanship. No warranty claim shall be honored unless received by DuPont within 90 d of the date the garment or accessory was shipped to the purchaser and/or end user or, within 12 mo from the date the encapsulated garment was shipped to the purchaser/end user. In no event shall DuPont be liable for any special, incidental, indirect, punitive or consequential damages, whether arising from contract, tort, warranty, representation, instruction, design or manufacturing defects, or any other cause or theory. Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user’s responsibility to determine the level of risk and the proper protective equipment needed for the user’s particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent right.

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GENERAL

Tychem® ThermoPro**Model:** TP189T

DuPont Personal Protection
 5401 Jefferson Davis Highway
 Richmond, Virginia 23234
 Customer Service
 800-931-3456 (Tel)
 843-335-8599 (Fax)
 personalprotection@usa.dupont.com

Manufacturer Type: Domestic
Information Source: <http://www.personalprotection.com>
Status: The vendor has responded—5/11/2005



NFPA Certification:
 NFPA 1992, 2005 Edition

OSHA EPA Level:
 Level B

NFPA Certification Number:
 LPS-DUP-01-Variant 01

Certifying Organization:
 SEI

Date Certified/Expected:
 September 19, 2005 SEI
 Intertek—Annual reverifications

Required Boots:
 Onguard Industries—Hazmax (87012) boots not included

Required Gloves:
 To protect the hands from heat and flame, wear outer gloves suitable for thermal protection, such as those compliant with NFPA 1971 or NFPA 1951. For additional chemical protection, an intermediate chemical barrier glove, such as an Ansell Barrier® or North Silver Shield worn over an inner, cotton or knit Kevlar® glove, may be considered. (Gloves not included)

Respiratory Equipment: Not specified

Unit Cost: \$432

Availability: In stock

References: Not specified

Other Certifications: NFPA 2112 (Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire)

Independent Testing: Not applicable

Material Technology: Tychem® ThermoPro—Provides flash fire escape and liquid-chemical splash protection by combining the trusted chemical protection of Tychem® and thermal protection of Nomex® into a single layer garment. Seams are sewn and sealed with hot air welded tape. Permeation and physical property data are available online at: www.personalprotection.dupont.com or you can request a copy from customer service at 800-931-3456.

Design/Configuration: Currently, this garment does not have a pass-through(s). Pass-throughs can be installed but first must be NFPA certified (minimum order required). Front entry and size specific.

Ensemble Design and Description: Hooded coverall, zipper front, elastic wrist, and sock boots with boot flaps. A user-supplied boot must be worn over the attached sock with the boot-top covers pulled down over the upper portion of the boot to prevent liquid pooling inside the boot.

1. The garment shall be constructed of an innovative new fabric from DuPont that utilizes proprietary Tychem® chemical barrier technology combined with Nomex® thermal protective fabric technology.
2. The garment shall be constructed in a coverall design with attached, respirator fit, drawstring hood.
3. The garment shall have wrists with tunnelized elastic.
4. The garment shall have attached socks with boot top covers made of the garment material.
5. The garment shall have seams which are sewn with aramid thread.
6. The garment shall have seams which are sealed with tape welded on the outside of the garment seams.
7. The tape used to cover the seams shall be a film composite with equal or greater chemical resistance than the base fabric.
8. The 81 cm (32 in) zipper shall be constructed with metal teeth set in a web made of DuPont™ Nomex®.

9. The closure shall be covered by two flaps made of garment material. The outer storm flap is fastened with hook-and-loop material made from FR treated polyamide.
10. The hood drawstring is made from Nomex® and Kevlar® fiber.
11. The garment shall be bright orange or gray in color.
12. The garment shall be certified as compliant to the current edition of NFPA 2112 by an independent 3rd-party certification organization.
13. The garment shall be certified as compliant to the current edition of NFPA 1992 by an independent 3rd-party certification organization.

Required Elements: Attached bootie worn with outer boot.

Respiratory equipment—Currently, this garment does not have a pass-through(s). Pass-throughs can be installed but first must be NFPA certified. Minimum order required.

To protect the hands from heat and flame, wear outer gloves suitable for thermal protection, such as those compliant with NFPA 1971 or NFPA 1951. For additional chemical protection, an intermediate chemical barrier glove, such as an Ansell Barrier® or North Silver Shield worn over an inner, cotton or knit Kevlar® glove, may be considered.

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 1 and 1991 CB option plus additional CA protection. TP189T does not have an attached glove.

BAs Protected Against: TP189T does not have an attached glove

TIMs Protected Against: Meets 1994, 1991, and 1992 plus additional chemical threats. TP189T does not have an attached glove.

Duration of Protection: Between 60 min and 119 min. Duration controlled by heat stress and respirator capability.

Acetone cyanohydrin—75-86-5—100 %—>480 min—0.05—ASTM F 739
Acrolein—107-02-8—100 %—63 min—0.41—ASTM F 739
Acrylonitrile—107-13-1—100 %—>480 min—<0.01—ASTM F 739
Allyl alcohol—107-18-6—100 %—>480 min—0.04—ASTM F 739
Ammonia—7664-41-7—100 % gas—>480 min—<0.01—ASTM F 739
Carbon disulfide—75-15-0—100 %—>480 min—<0.15—ASTM F 739
Chlorine—7782-50-5—100 % gas—>480 min—<0.025—ASTM F 739
Chlorosulfonic acid—7790-94-5—100 %—>480 min—0.0003—ASTM F 739
Ethylene dibromide—106-93-4—100 %—288 min—0.52—ASTM F 739
Ethylene oxide—75-21-8—100 % gas—>480 min—<0.01—ASTM F 739
Formaldehyde (37 %)—50-00-0—100 %—>480 min—<0.001—ASTM F 739
Hydrogen bromide—10035-10-6—100 % gas—>480 min—0.0001—ASTM F 739
Hydrogen chloride—7647-01-0—100 % gas—>480 min—<0.01—ASTM F 739
Hydrogen fluoride—7664-39-3—100 % gas—I mm—High—ASTM F 739
Methyl hydrazine—60-34-4—100 %—283 min—0.98—ASTM F 739
Methyl isocyanate—624-83-9—100 %—I mm—0.42—ASTM F 739
Methyl mercaptan—74-93-1—100 % gas—>480 min—0.05—ASTM F 739
Nitric acid, fuming—7697-37-2—100 %—14 min—>50—ASTM F 739
Nitrogen dioxide—10102-44-0—100 % gas—14 min—>0.2—ASTM F 739
Phosgene—75-44-5—100 % gas—>480 min—<0.02—ASTM F 739
Phosphine—7803-51-2—100 % gas—I mm—>0.11—ASTM F 739
Phosphorous trichloride—7719-12-2—100 %—>480 min—<0.003—ASTM F 739
Sulfur dioxide—7449-09-05—100 % gas—38 min—2—ASTM F 739
Sulfuric acid, concentrated—7664-93-9—95-98 %—>480 min—<0.01—ASTM F 739
Sulfuryl chloride—7791-25-5—100 %—>480 min—<0.01—ASTM F 739
Titanium tetrachloride—7550-45-0—100 %—>480 min—<0.0001—ASTM F 739

Ensemble Application: Flammable or flash fire environment. IDLH environments or atmosphere with less than 19.5 % oxygen concentration is respirator dependent. Radiation protection against radioactive particles, not ionizing neutrons, gamma-ray, or x-ray radiation. Deep frozen protection media depends on additional thermal protection of hands

Flame Resistance: Certified to NFPA 1992 and NFPA 2112

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 1021 g (2.25 lb)

Ensemble weight (plus components): 3.76 kg (8.30 lb)*

* weight consists of suit with Onguard Hazmax Boots, size 11, with no pass-throughs

Unit area weight of material used: 192 g/m² (8.1 oz/yd²)**

Material thickness of the ensemble: 864 μ (34 mil)**

**unit weight and thickness apply to garment material only

Comfort ASTM: Test subject was able to complete all tasks as specified in the standard (ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity)

Construction: Sewn, taped, and heat-sealed. The garment shall have seams which are sewn with aramid thread. The garment shall have seams which are sealed with tape welded on the outside of the garment seams. The tape used to cover the seams shall be a film composite with equal or greater chemical resistance than the base fabric.

Colors: Bright orange or gray—Please contact customer service for special product applications

Dexterity: TP189T does not have an attached glove

Visual Acuity/Visibility: Attached respirator fit, drawstring hood. No visor.

FOV: Not applicable

Don/Doff: Assistance is not needed for donning and/or doffing. Average time is <60 s but varies with practice, skill, and whether assistance is provided.

Operational Limitations: Users should use WBGT method for heat stress environmental modeling and a clothing correction factor of 10 °C (50 °F) for hooded coveralls and higher for encapsulated ensembles. Working in hot, humid environments depends on level of work activity, rest/work cycle, health of the individual, as well as temperature, humidity, wind speed, and radiant heating.

MCC Capability: Ensemble has the ability to be used with microclimate cooling systems. Currently, this garment does not have a pass-through(s). Pass-throughs can be installed but first must be NFPA certified. Minimum order required.

Environmental Conditions: Ensemble has been tested against environmental performance measures. Measured results exceed standard's requirements. TP189T does not have an attached glove.

LOGISTICS/TRAINING

TDP: Technical data package is included with all NFPA certified garments. For additional copies, please call customer service at 800-931-3456.

Training:

- **Training Hours:** Level of training on Tychem® garments depends on prior qualifications and training of end user. A HazMat technician requires less product-specific training than a novice user. Training documentation available from the manufacturer. Contact customer service at 800-931-3456.
- **Training Required:** Training documentation available from the manufacturer. Contact customer service at 800-931-3456.
- **Training Available:** Training is available through manuals. Training does not result in certification.
- **Manuals Available:** User manuals are included with all NFPA certified suits and all Level A suits. For additional copies, please visit our website at: www.personalprotection.dupont.com, or call customer service at 800-931-3456.

Cleanability: Garments should be clean and dry before use. Water and mild, household dishwashing liquid should be used to clean these garments. These garments may be scrubbed with a soft brush or hand towel, thoroughly rinsed with clean, fresh water and air-dried.

Cleaning Products: Do not use any oxidative, corrosive or reactive decontamination solutions with these garments. Do not dry-clean these garments. Do not use hot air or a tumbling air dryer to dry these garments. Do not use bleach.

Use/Reuse: Do not reuse if contaminated

Shelf Life: 6 yr to 10 yr—DuPont™ suggests Tychem® chemical garments can be used as long as they pass a visual inspection test, and in the case of Level A garments, the ASTM F1052 inflation test). Tychem® chemical garments do not have a fixed shelf life. DuPont™ suggests retiring garments to “Training Use Only” 5 yr after date of receipt. See storage life statement at www.personalprotection.com.

Maintenance Required: All PPE should be inspected prior to each use, refer to 29 CFR 1910, Subpart I, Personal Protective Equipment Standards for General Industry. See the DuPont™ Personal Protection (DPP) user manual for specific instructions. (Extra copies are available online at www.personalprotection.dupont.com). Maintenance frequency is before and after each use and at least annually.

Maintenance Cost: Not applicable

Storage Conditions: Temperature range: <49 °C (<120 °F). Relative humidity range: 0 % to 100 %. Preferably, garments should be stored in a cool, dark, dry location, free of dirt and insects. Sunlight, ozone, high temperatures >49 °C (>120 °F), vehicle exhaust fumes, compression under heavy weights and sharp edges or projections are some conditions known to degrade the materials in these ensembles. Garments should be stored in boxes, in bags or on hangers. Never step on chemical protective garments. Never place or store heavy objects on top of chemical garments.

Consumables: Not applicable

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: X-small, medium, large, X-large, XX-large, XXX-large. 4X-large, 5X-large and small are available by special order.

SPECIAL PARAMETERS

Health Hazards: If the garment has elastic wrists, ankles and/or an elastic hood opening, the elastic may contain natural rubber latex

Latex/Allergens: Garment contains latex; Garments are considered “articles” and are exempt from MSDS reporting requirements. The garments are nonhazardous.

Communications: Currently, this garment does not have a pass-through(s). Pass-throughs can be installed but first must be NFPA certified. Minimum order required.

EOD Compatibility: Ensemble does not have the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: DuPont makes no guarantee of results and assumes no obligation or liability in connection with the use of DuPont garments and accessories. It is the user’s responsibility to determine the level of hazards and the proper personal protective equipment needed. DuPont warrants to the purchaser/end user only for a period of 90 d from date the garment or accessory was shipped to the purchaser/end user or, for a period of 12 mo from the date the encapsulated garment was shipped to the purchaser/end user that the garment and accessory, if any, are free of defects in materials and workmanship. Since conditions of use are outside DuPont’s control, DuPont makes no other warranties of any kind, expressed or implied, including, without limitation, no warranties of merchantability or fitness for a particular use and assumes no liability in connection with any use of the DuPont garment and accessories. This warranty is void in the event any party including purchaser/end user modifies the garment or accessory in any way. The sole and exclusive remedy for all purchasers and/or end users for any and all claims, losses, injuries or damages of any kind relating to or arising from DuPont garments and accessories, shall be the refund of the purchase price or the replacement or repair of any garment or accessory found to contain a defect in materials or workmanship upon inspection by DuPont. Only DuPont shall determine the form of remedy (repair, replacement, or refund) for items containing a defect in materials or workmanship. No warranty claim shall be honored unless received by DuPont within 90 d of the date the garment or accessory was shipped to the purchaser and/or end user or, within 12 mo from the date the encapsulated garment was shipped to the purchaser/end user. In no event shall DuPont be liable for any special, incidental, indirect, punitive or consequential damages, whether arising from contract, tort, warranty, representation, instruction, design or manufacturing defects, or any other cause or theory. Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user’s responsibility to determine the level of risk and the proper protective equipment needed for the user’s particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent right.

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GENERAL

SE-Shield Personal Protective Ensemble/VPS

Model: S-VPS

Stock: 50090

Safety Equipment America, Inc. (The SEA Group)
 11 Business Park Drive
 Branford, Connecticut 06405
 Bengt Kjellberg, President
 203-483-9483 (Tel)
 888-732-3500 (Tel) (Toll Free US and Canada)
 203-483-6633 (Fax)
 bengtk@sea.com.au

Manufacturer Type: Foreign—Trelleborg Industries, Ystad Sweden

Information Source: <http://www.sea.com.au>
<http://www.trelleborg.com/protective/>
 NIJ Guide for Personal Protection Equipment for Emergency First Responders, April 2001

Responder Knowledge Database (RKB)

Status: The vendor has responded—10/18/2006

**NFPA Certification:**

Not yet NFPA certified for use with a PAPR

OSHA EPA Level:

Level C

NFPA Certification Number:

Not applicable

Certifying Organization:

Not applicable

Date Certified/Expected:

Not applicable

Required Boots:

Onguard Industries—Hazmax (87012)

Required Gloves:

Glove system provided with suit

Respiratory Equipment: Not specified

Unit Cost: \$4.4K

Availability: Delivery time provided on request

References: Provided on request

Other Certifications: SEA uses the Trelleborg Viking, Inc., VPS fully encapsulated garment, but has modified it with two with two ports for use with a PAPR. This precludes the ensemble from being certified.

Independent Testing: TNO Netherlands CAs (GB, GD, HD, GA, VX, L, AS, and CG). Test date 2003.

Material Technology: SEA/VPS uses the Trelleborg VPS ensemble material. Gas and liquid tight fabric construction. Strong and flexible polyamide fabric coated on the outside with chloroprene rubber. It is coated on the inside with chloroprene rubber and a barrier film laminate.

Design/Configuration: Point of entry—front or rear entry design. Internal structural support—fabric substrate. Pass-through options. Ensemble is size specific and conforms to the body. Attached gloves (replaceable) are multi-layer (inner barrier, outer rubber, and Kevlar over). Attached bootie worn with outer boot.

Ensemble Design and Description: Suit made by Trelleborg exclusively for SEA. Ensemble is designed by a tailor for comfort and fit. Type TE is a totally encapsulating/Level A design where the breathing apparatus is worn inside the suit and fully certified to the NFPA 1991 as well as to the European standard EN 943. Type T is a nonencapsulating design where the breathing apparatus is worn outside the suit. Trelchem VPS type TE model VP1 provides protection against hazardous chemicals in liquid, vapor, gaseous, and/or solid form. Trelchem® VPS types T and TE are CE marked and fulfill EN 943 parts 1 and 2 (Emergency Teams). Ensemble has integrated socks/booties in the garment material. Also, a pair of silicone-coated oversocks is supplied with the suit. The standard glove assembly consists of two layers. A pair of separate thin inner comfort gloves of cotton is supplied with the suit. The suit can be delivered with a semi-fixed attached Viton®/Butyl rubber gloves in combination with wrist cuffs for increased safety. Visor is extra large, made from impact resistant 2 mm PVC. Downward closing zipper is long heavy-duty gas-tight on the front left side for easy donning and doffing. Ensembles are equipped with an integrated possibility for ventilation.

Required Elements: Integrated socks/booties. Alternatively, the suit is supplied with fixed safety boots.

Inner glove made of a silver colored barrier film laminate. Fixed by a "snap-on" arrangement for easy replacement. Outer glove made of a flame retardant chloroprene rubber. Semi-attached to the suit by an elastic band. NFPA certified versions come with a

cut-resistant Kevlar® over glove. Alternatively the suit can be delivered with semi-fixed attached Viton®/Butyl rubber gloves in combination with wrist cuffs for increased safety. A pair of separate thin inner comfort gloves of cotton is always supplied with the suit.

Rubber face sealing anatomically designed for optimum safety and comfort (type T suits). High impact resistant 2 mm special PVC visor (type TE suits).

OPERATIONAL

CAs Protected Against: NFPA 1992, 2005 Edition, equal to NFPA 1994 Class 1 CA permeation [100 g/m² (4.2 oz/yd²)]. Not certified with PAPR.

Mustard gas (HD) >24 h breakthrough

Lewisite (L) >24 h breakthrough

Tabun (GA) >24 h breakthrough

Sarin (GB) >24 h breakthrough

Soman (GD) >24 h breakthrough

VX >24 h breakthrough

Arsine (AS) >8 h breakthrough

Phosgene (CG) >8 h breakthrough

Cyanogen chloride (CK) >1 h breakthrough

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats). Modified suit for PAPR is Level C.

TIMs Protected Against: Meets NFPA 1994 Class 2/3 liquid and/or gas permeation requirements. Modified suit for PAPR is Level C.

Duration of Protection: Recommend 1 h, but suit material provides 8 h

Breakthrough time of most chemicals is >480 min, with few exceptions

Ensemble Application: Modified suit for PAPR (Level C) used in non IDLH environments with at least 19.5 % oxygen

Flame Resistance: Material meets NFPA 1991 flame resistance requirements

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 4.8 kg (10.6 lb)

Ensemble weight (plus components): 7.39 kg (16.3 lb)

Unit area weight of material used: 650 g/m² (27 oz/yd²); 0.5 ml thickness of material

Comfort ASTM: An ASTM F 1154 qualitative evaluation has been conducted. It is NFPA 1991 compliant.

Construction: Seams can be sewn, taped, welded, and glued. Seams are stitched with an aramide thread. They are covered on the outside with a chloroprene rubber strip and on the inside with a welded-on barrier film laminate strip. There are 26 seams; seams estimate approximately 10 yd linear.

Colors: VPS/VP1—yellow and black—camouflage is not available

Dexterity: Dexterity performance reduction—206 %

Visual Acuity/Visibility: Visual acuity is 20/30. It is NFPA 1991 compliant.

FOV: FOV—80 %. Because visor is not fixed to head, the FOV can vary. Anti-fog lenses are available as an option.

Don/Doff: >60 s for assisted donning and/or doffing

Operational Limitations: -40 °C to 66 °C (-40 °F to 150 °F). Relative humidity—0 % to 100 %. Duration of operation limited by duration of air source. All suit ventilation systems are available.

MCC Capability: Ensemble has pass-throughs for microclimate cooling

Environmental Conditions: Ensemble has met the cold temperature performance test (Class 1 and 2: Cold Temperature Performance Test (ASTM D 747)

VPS/VP1—0.1463 in lb machine direction and 0.1430 in lb across

LOGISTICS/TRAINING

TDP: Technical data package comes with each suit

Training:

- **Training Hours:** Less than 8 h provided by the manufacturer. Training documentation is available from the manufacturer. Required training includes donning and doffing, maintenance, and testing and repair.
- **Training Required:** Donning and doffing, maintenance, and testing and repair
- **Training Available:** Classroom/Online—Upon request
- **Manual/CD/Video—Trellchem—Manual, CD, or video**

- Training CD comes with each ensemble
- **Manuals Available:** User instructions with each ensemble

Cleanability: Ensemble is multiple use. It can be cleaned multiple times with brush (with mild soap and water).

Cleaning Products: Water and additional commercial detergents

Use/Reuse: Ensemble can be decontaminated depending on the chemical contamination

Shelf Life: Ensemble has a shelf life over 10 yrs

Maintenance Required: Inspect and pressure test after each use and annually. Lubricate zipper and store in cool environment. Maintenance costs are \$0—provided suit is not used.

Maintenance Cost: \$0—provided suit is not used

Storage Conditions: 4 °C to 27 °C (40 °F to 80 °F). Relative humidity—0 % to 90 %. Keep away from direct sunlight. Store the suit hanging or folded in a cool, dry place. Avoid direct sunlight. Store the suit in a plastic bag. To prevent pressure damage, do not stack suits on top of one another, unless in individual cartons. If stored folded, the suit should be unfolded and inspected every 6 mo when not in use. Recommended storage life is 5 yr for S-VPS when stored as described above. In practice, life expectancy may exceed these recommendations. The suit should be stored with the zipper fully open, or with at least approximately 10 cm open.

Consumables: 4H/Silver Shield gloves—\$10

Rubber gloves—\$70

Suit bags, hangers, gloves, test kits, repair kits, CDROM, and suit manual

Consumables Costs: 4H/Silver Shield gloves—\$10

Rubber glove—\$70

Package Shape/Size (Storage): Oblong—Less than or equal to 0.113 m³ (4.0 ft³); 79 cm x 48 cm x 36 cm (31 in x 19 in x 14 in)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large

SPECIAL PARAMETERS

Health Hazards: Ensemble does not contain allergens

Latex/Allergens: Ensemble does not contain latex; MSDS is not available

Communications: Ensemble has communication capability

EOD Compatibility: Not specified

Warranty: 3 yr against manufacturer defects

GENERAL

SE-Shield Personal Protective Ensemble/HPS**Model:** S-HPS**Stock:** 50096

Safety Equipment America, Inc. (The SEA Group)
 11 Business Park Drive
 Branford, Connecticut 06405
 Bengt Kjellberg, President
 203-483-9483 (Tel)
 888-732-3500 (Tel) (Toll Free US and Canada)
 203-483-6633 (Fax)
 bengtk@sea.com.au

Manufacturer Type: Foreign—Trelleborg Industries, Ystad
 Sweden

Information Source: <http://www.sea.com.au>
<http://www.trelleborg.com/protective/>
 NIJ Guide for Personal Protection Equipment for Emergency
 First Responders, April 2001
 Responder Knowledge Database (RKB)

Status: The vendor has responded—10/18/2006

**NFPA Certification:**

Not yet NFPA certified for use with a PAPR

OSHA EPA Level:

Level C

NFPA Certification Number:

Not applicable

Certifying Organization:

Not applicable

Date Certified/Expected:

Not applicable

Required Boots:

Onguard Industries—Hazmax (87012)

Required Gloves:

Glove system provided with suit

Respiratory Equipment: Not specified

Unit Cost: \$5.5K

Availability: Delivery time provided on request

References: Provided on request

Other Certifications: SEA uses the Trelleborg Viking, Inc., HPS fully encapsulated garment, but has modified it with two with two ports for use with a PAPR. This precludes the ensemble from being certified.

Independent Testing: TNO Netherlands CAs (GB, GD, HD, GA, VX, L, AS, and CG). Test date 2003.

Material Technology: SEA/HPS uses the Trelleborg HPS ensemble material. Laminated layers of rubber and plastics onto woven fabric—Viton and butyl rubber with fabric substrate and barrier film laminate on the inside.

Visor material—2 mm (0.079 in) high impact PVC

Footwear material—silicone-coated oversocks

Glove material—multilayer silver colored polymer laminate film inner layer and a chloroprene rubber outer layer

Zipper—Dynat SD zipper, chain of a copper zinc, nickel alloy (white copper); tape is made of chloroprene rubber coated; free edge held in place by Velcro

Design/Configuration: Point of entry—front or rear entry design. Internal structural support—fabric substrate. Pass-through options. Ensemble is size specific and conforms to the body. Attached gloves (replaceable) are multi-layer (inner barrier, outer rubber, and Kevlar over). Attached bootie worn with outer boot.

Ensemble Design and Description: Suit made by Trelleborg exclusively for SEA. Ensemble is designed by a tailor for comfort and fit. Each ensemble delivery includes one separate pair of thin inner comfort gloves made of cotton. The ensemble is delivered with a pair of silicone-coated oversocks to ease the donning of the safety boots. Ensemble has integrated socks/booties in the garment material. Also, a pair of silicone-coated oversocks is supplied with the suit. The standard glove assembly consists of two layers. A pair of separate thin inner comfort gloves of cotton is supplied with the suit. The suit can be delivered with a semi-fixed attached Viton®/Butyl rubber gloves in combination with wrist cuffs for increased safety. Visor is extra large, made from impact resistant 2 mm PVC. Downward closing zipper is long heavy-duty gas-tight on the front left side for easy donning and doffing. Ensemble are equipped with an integrated possibility for ventilation. Four exhaust valves and an affixed ventilation system capable of circulating cooling air through the suit at either 2/30 L/min.

Required Elements: Integrated socks/booties. Alternatively, the suit is supplied with fixed safety boots.

Inner glove made of a silver-colored barrier film laminate. Fixed by a “snap-on” arrangement for easy replacement. Outer glove made of a flame retardant chloroprene rubber. Semi-attached to the suit by an elastic band. NFPA certified versions come with a cut-resistant Kevlar® over glove. Alternatively the suit can be delivered with semi-fixed attached Viton®/butyl rubber gloves in combination with wrist cuffs for increased safety. A pair of separate thin inner comfort gloves of cotton is always supplied with the suit.

OPERATIONAL

CAs Protected Against: NFPA 1992, 2005 Edition, equal to NFPA 1994 Class 1 CA permeation [100 g/m² (4.2 oz/yd²)]. Not certified with PAPR.

Mustard gas (HD) >24 h breakthrough

Lewisite (L) >24 h breakthrough

Tabun (GA) >24 h breakthrough

Sarin (GB) >24 h breakthrough

Soman (GD) >24 h breakthrough

VX >24 h breakthrough

Arsine (AS) >8 h breakthrough

Phosgene (CG) >8 h breakthrough

Cyanogen chloride (CK) >1 h breakthrough

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats). Modified suit for PAPR is Level C.

TIMs Protected Against: Meets NFPA 1994 Class 2/3 Liquid and/or gas permeation requirements. Modified suit for PAPR is Level C.

Rad/Nuc Materials Protected Against: Yes

Duration of Protection: Recommend 1 h, but suit material provides 8 h

Breakthrough time of most chemicals is >480 min

Ensemble Application: Modified suit for PAPR (Level C) used in non-IDLH environments with at least 19.5 % oxygen

Flame Resistance: Material meets NFPA 1991 flame resistance requirements

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 5.72 kg (12.6 lb)

Ensemble weight (plus components): 8.39 kg (18.5 lb)

Unit area weight of material used: 690 g/m² (29 oz/yd²); 0.5 ml thickness of material

Comfort ASTM: An ASTM F 1154 qualitative evaluation has been conducted. It is NFPA 1991 compliant.

Construction: Butt seam stitched with an aramide thread. Outside covered with a Viton® rubber strip. Inside covered with a welded-on barrier film laminate strip. Long heavy duty gas-tight zipper protected by an external splash protective flap.

Colors: HPS is available in red and olive green—camouflage is not available

Dexterity: Dexterity performance reduction—206 %

Visual Acuity/Visibility: Visual acuity is 20/30. It is NFPA 1991 compliant.

FOV: FOV—80 %. Because visor is not fixed to head, the FOV can vary. Anti-fog lenses are available as an option.

Don/Doff: >60 s for assisted donning and/or doffing

Operational Limitations: -40 °C to 66 °C (-40 °F to 150 °F). Relative humidity—0 % to 100 %. Duration of operation limited by duration of air source. All suit ventilation systems are available.

MCC Capability: Ensemble has pass-throughs for microclimate cooling

Environmental Conditions: Ensemble has met the cold temperature performance test (Class 1 and 2: Cold Temperature Performance Test (ASTM D 747)

HPS—0.022 lbf machine direction and across

LOGISTICS/TRAINING

TDP: Technical data package comes with each suit

Training:

- **Training Hours:** Less than 8 h provided by the manufacturer. Training documentation is available from the manufacturer. Required training includes donning and doffing, maintenance, and testing and repair.
- **Training Required:** Donning and doffing, maintenance, and testing and repair
- **Training Available:** Classroom/Online—Upon request
- **Manual/CD/Video—Trellchem—Manual, CD, or video**

- Training CD comes with each ensemble
- **Manuals Available:** User instructions with each ensemble

Cleanability: Ensemble is multiple use. It can be cleaned multiple times with brush (with mild soap and water).

Cleaning Products: Water and additional commercial detergents

Use/Reuse: Ensemble can be decontaminated depending on the chemical contamination

Shelf Life: Ensemble has a 6 yr to 10 yr shelf life

Maintenance Required: Inspect and pressure test after each use and annually. Lubricate zipper and store in cool environment. Maintenance costs are \$0—provided suit is not used.

Maintenance Cost: \$0—provided suit is not used

Storage Conditions: 4 °C to 27 °C (40 °F to 80 °F). Relative humidity—0 % to 90 %. Keep away from direct sunlight. Store the suit hanging or folded in a cool, dry place. Avoid direct sunlight. Store the suit in a plastic bag. To prevent pressure damage, do not stack suits on top of one another, unless in individual cartons. If stored folded, the suit should be unfolded and inspected every 6 mo when not in use. Recommended storage life is 7 yr for S-HPS when stored as described above. In practice, life expectancy may exceed these recommendations. The suit should be stored with the zipper fully open, or with at least approximately 10 cm open.

Consumables: 4H/Silver Shield gloves—\$10

Rubber gloves—\$70

Suit bags, hangers, gloves, test kits, repair kits, CDROM, and suit manual

Consumables Costs: 4H/Silver Shield gloves—\$10

Rubber glove—\$70

Package Shape/Size (Storage): Oblong—Less than or equal to 0.113 m³ (4.0 ft³); 77.5 cm x 58 cm x 22 cm (30.5 in x 23 in x 8.5 in)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large

SPECIAL PARAMETERS

Health Hazards: Ensemble does not contain allergens

Latex/Allergens: Ensemble does not contain latex; MSDS is not available

Communications: Ensemble has communication capability

EOD Compatibility: Not specified

Warranty: 3 yr against manufacturer defects

GENERAL

DTAPS® Level B Totally-Encapsulating Ensemble

Model: 70–100 (complete ensemble)

Stock: 70–200 (ensemble without SCBA); 10–260 (garment only)

GEOMET Technologies, LLC.

20251 Century Boulevard, Suite 300

Germantown, Maryland 20874–1192

Hoyt Hughes

301–428–9898 x 252 (Tel)

301–428–9482 (Fax)

hhughes@geomet.com

Manufacturer Type: Domestic

Information Source: <http://www.nbcprotect.com>

<http://www.dtaps.com>

Status: The vendor has responded—6/30/2006



NFPA Certification:

NFPA 1994 Class 2, 2001 Edition

OSHA EPA Level:

Level B

NFPA Certification Number:

CBT–GEO–03

Certifying Organization:

SEI

Date Certified/Expected:

December 22, 2005

Required Boots:

Onguard Industries—Hazmax (87012)

Required Gloves:

North neoprene/butyl (attached)

Respiratory Equipment: Respirator tested with the ensemble was the Interspiro S3, but any SCBA can be used

Unit Cost: \$572.75 (suit only); \$656.65 with boots

Availability: Manufactured on demand with a 30 d lead time

References: National Logistics Activity (through EAI)

Other Certifications: None

Independent Testing: CA testing and TICs/TIMs permeation testing by independent accredited laboratories

Material Technology: Ensemble is constructed of impermeable materials; garment incorporates a liquid-resistant front-entry zipper closure; gloves are mechanically attached to garment sleeve with a rigid plastic ring and O-ring system; bootie is integral to garment

Design/Configuration: Front entry and size specific design. Donning/doffing time and assistance will be noted. Pass-through options. Gloves can be changed by the user to accommodate different hand sizes for a given suit size.

Ensemble Design and Description: Closure is a liquid-resistant front-entry zipper with double splash flaps; garment has integral booties with outer boot splash flaps; gloves are mechanically attached to garment; single exhaust valve in back of head; totally-encapsulating design will accommodate any SCBA, including closed-circuit SCBAs (rebreathers)

Required Elements: Attached bootie worn with outer boot (Onguard Hazmax)

Attached gloves, replaceable, multi-layer glove requirements (inner and outer gloves are mechanically attached to garment, but are user replaceable.)

The ensemble has the ability to accommodate pass-through(s) for respirators

Number of pass-throughs—2 (cooling and communication equipment)

Ensemble is certified with Onguard Hazmax boots and Interspiro SCBA; gloves are mechanically attached to garment

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 2 CA permeation resistance and limited vapor protection requirement (ensemble test). Material tested against GA and GD (in addition to GB, HD, L, and VX); seams independently tested against GB.

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats). Meets NFPA 1994, Class 2 requirements.

TIMs Protected Against: Meets 1994, 1991/1992 ASTM F 1001 battery of 21 chemicals. Tychem LV permeation data is available for more than 250 chemicals. Please refer to DuPont's Permeation Guide for Tychem Fabrics and the DuPont Fax-on-Demand Data Service at 800–558–9329.

Rad/Nuc Materials Protected Against: Not tested; some level of protection provided

Duration of Protection: 45 min (limited by amount of air in SCBA cylinder). Tychem LV material provides greater than 8 h of permeation resistance for most of the ASTM F 1001 chemicals, plus greater than 8 h of permeation resistance for over 200 additional chemicals.

Refer to DuPont's Permeation Guide for Tychem Fabrics and the DuPont Fax-on-Demand Data Service at 800-558-9329.

Ensemble Application: Explosive atmospheres, IDLH environments or atmosphere with less than 19.5 % oxygen concentration, and biological

Flame Resistance: No

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 1.82 kg (4 lb)

Ensemble weight (plus components): 18.6 kg (41 lb)

Garment with gloves is 1.82 kg (4 lb); boots are 3.18 kg (7 lb), SCBA is approximately 13.6 kg (30 lb), (depending on amount of air in cylinder)

Unit area weight of garment material used: 142 g/m² (6.6 oz/yd²)

Material thickness of the ensemble (garment): 533 μ (30 mil)

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has been conducted for the ensemble. Passes requirements in NFPA 1994.

Construction: Sewn, taped, and heat-sealed seams (11 seams total)

Back seam—208 cm (82 in); arm seam (2 each)—69 cm (27 in); arm hole (2 each)—79 cm (31 in); leg seam (2 each)—76 cm (30 in); bootie/leg hole (2 each)—38 cm (15 in); SCBA pod—102 cm (40 in); and head section seam—239 cm (94 in)

Colors: Garment is olive drab green, but can be constructed of Tychem Barricade, which is yellow

Dexterity: Less than 22 % dexterity performance reduction. Passes NFPA 1994, Class 2 requirement of less than 450 % increase over barehanded control.

Visual Acuity/Visibility: Better than or equal to 20/35

FOV: 80 % (~145° field of view). Visor is 28 cm to 38 cm (11 in to 15 in) wide by 39 cm (15.5 in) high.

Don/Doff: Assistance is needed for donning and/or doffing. Average donning time is >60 s.

Operational Limitations: Temperatures range -18 °C (0 °F) to 49 °C (120 °F). Material will stiffen in temperatures below -18 °C (0 °F).

MCC Capability: A passthrough is available for use with an optional personal ice cooling system

Environmental Conditions: Ensemble has met the cold temperature performance test. Glove has met independent cold temperature performance tests and exceeds standard's requirements. Bending moment less than 0.5 in-lbf per NFPA 1994, Class 2.

LOGISTICS/TRAINING

TDP: Technical data package is available. Hard copy and/or electronic copy available upon request. User and instruction manual is included in box with garment.

Training:

- **Training Hours:** <8 h provided by the manufacturer. 2 h for operation. Training documentation is available from the manufacturer.
- **Training Required:** 2 h for operation
- **Training Available:** Classroom training—DTAPS Level B totally-encapsulating ensemble training. Offsite and onsite training results in certification. Training available at additional cost upon request. Contact GEOMET for details.
- **Manuals Available:** User instruction manual included in box with garment

Cleanability: If not contaminated, ensemble (exclusive of consumables such as outer gloves) can be cleaned and reused.

Garment is limited use, but can be used as a training suit if not contaminated. Suit must be disposed of after any liquid or vapor chemical exposure.

Cleaning Products: Garment can be cleaned and reused as training suit only; hand wash with warm water and mild detergent, then rinse with clean water and hang to dry; treat with biocide after each training use. Disposal procedures are available. The recommended disposal method is to immerse the suit in household bleach (5 % solution) for 24 h. After 24 h, the suit should then be incinerated or landfilled in a secured, permitted hazardous waste landfill in accordance with all applicable Federal, state, and local laws and regulations.

Use/Reuse: Garment is limited use, but can be used as a training suit if not contaminated. Suit must be disposed of after any liquid or vapor chemical exposure.

Shelf Life: 1 yr to 5 yr

Maintenance Required: Before and after each use and annually

Maintenance Cost: None

Storage Conditions: Temperature—10 °C to 24 °C (50 °F to 75 °F). Relative humidity—50 % to 90 %. Store in a cool, dark, dry place free from insects and away from direct sunlight (ultraviolet light).

Consumables: None

Consumables Costs: Not applicable

Package Shape/Size (Storage): Cube—Greater than 0.113 m³ (4.0 ft³)

Ensemble box—56 cm x 56 cm x 28 cm (22 in x 22 in x 11 in) = 3.1 ft³ (garment with gloves, boots)

SCBA case—32 cm x 71 cm x 46 cm (12.5 in x 28 in x 18 in) = 3.7 ft³

Garment box only—41 cm x 41 cm x 38 cm (16 in x 16 in x 15 in) = 2.2 ft³

Sizes Available: Small, medium, large, X-large, XX-large, and XXX-large. 2XL and 3XL available as special orders.

SPECIAL PARAMETERS

Health Hazards: Ensemble does not contain allergens

Latex/Allergens: Ensemble does not contain latex; MSDS available for garment material of construction

Communications: Ensemble has the ability to interface with a communications system. DTAPS Level B suit is compatible with various commercial radio systems, such as the optional intrinsically-safe DWIS radio system.

EOD Compatibility: Only EOD compatible if Bomb Suit can be worn under DTAPS suit

Warranty: Manufacturer warranty is 90 d after delivery of DTAPS® garment. GEOMET warranty covers defects in materials and workmanship in the garment when used in accordance with the instructions contained in the User's Instruction Manual.

GENERAL

New Pac C/91, C/91R, C/91FR and First Responder Kit**Model:** C/91, C/91R, C/91FR**Stock:** C/91, C/91R, C/91FR, and First Responder Kit

New Pac Safety AB
 PO Box 174
 SE-566 23 Habo, Sweden
 +46 36 411 39 (Tel)
 +46 36 410 31 (Fax)
 info@newpac.se

Manufacturer Type: Foreign—Sweden and other European countries

Information Source: Homeland Security PPE Direct (North American Importer), an Operating Unit of Shoreline Associates, Inc.

North Branford, Connecticut 06471-0041

203-484-4600 (Tel)

203-484-4692 (Fax)

<http://www.HomelandSecurityPPEDirect.com>

MAmatrudo@HomelandSecurityPPEDirect.com

NIJ Guide for Personal Protection Equipment for Emergency First Responders, April 2001

Status: The vendor has responded—5/17/2005

**NFPA Certification:**

Planned for submission

OSHA EPA Level:

Level B

NFPA Certification Number:

Not applicable

Certifying Organization:

Not specified

Date Certified/Expected:

Planned for submission in 2006

Required Boots:

Integrated boots

Required Gloves:

Manufactured by New Pac

Respiratory Equipment: Can be used with SCBA, APR, or PAPR, or as part of the New Pac First Responder Kit; NBC filter

Unit Cost: \$129—Suit cost (with integrated boots and gloves)

\$325—First Responder kit, including suit, boots, gloves, carrying bag, mask, and CBRN filter

Availability: In stock

References: To be provided

Other Certifications: 1. CE-certified by the notified body 0402, SA, Borås, Sweden. Certificate No: 19 83 01

2. Meets European EU Directives 89/686/EEC, Article 10

3. Our suits/ensembles have been tested and CE-certified to EN 1512; Certificate Number 1908301.

4. The mask, where used, is NIOSH Certified TC 84A-3337

5. Meets NATO Military Standards for NBC Ensemble

6. Swedish Defense Lab Certification

Independent Testing: 1. The U.S. Army SBCCOM in Edgewood, Maryland has tested the ensemble. Favorable report received in Q4 of 2004.

2. Flame Testing of Suit Material—Performed in accordance with EN-943 using a moving direct flame contact at temperatures approximately 593 °C (1100 °F) “without the material burning or causing a hazard to the wearer.”

3. Battelle Labs—Test GD and HD (July 27, 1990).

Material Technology: Thermoplastic film technology (advanced, co-extruded, multi-layer, thermoplastic films are converted into several different, patented disposable garment designs by special heat sealing technique). Disposable, 10 ply, impermeable NBC and TIM skin protective 2-piece plastic (PE) garment with double barrier of EVAL (EVOH)

Design/Configuration: Suit is adjustable to accommodate various body types. Suit adjustable to accommodate bulky equipment. Wearer can don and doff suit without assistance. Size-adjustable. One size fits all, separate pants and over garment allow for easy donning and doffing. Ensemble has one certified pass-through for APR or PAPR (40 mm).

Ensemble Design and Description: Level B and/or Class 2/3 two-piece plastic garment with double barrier; can be used with SCBA, APR, PAPR, or as part of the New Pac First Responder Kit

1. Suit—manufactured from disposable, 10 ply impermeable NBC and TIM protective two-piece plastic polyethylene (PE) garment with double barrier of ethylene vinyl alcohol (EVAL/EVOH).
2. Two-piece suit with separate gloves.
3. Ensemble includes mask and filter. This full face piece APR consists of a CB40 mask manufactured from chloroprene-natural rubber, provides 80 % field of vision, includes speech diaphragm and NBC filter.
4. Current user(s) include first responders, military, industry and rescue personnel around the world, primarily in Europe and Southeast Asia. Marketing and sales in the United States commenced in 2003.
5. Over 1 000 000 New Pac CBRN suits in use around the world.
6. Although the material has been tested to temperature of over 538 °C (1100 °F), it is not fire retardant.
7. Transparent design allows for higher resistance to radiant heat and enhanced ability to identify the wearer.
8. Ensemble designed in one size for the vast majority of potential wearers to avoid confusion in emergency donning situations.
9. To minimize the potential of heat stress, the use of a cooling vest, which is available from the vendor, is recommended.
10. Donned similar to traditional pants and coat with hood. Pants donned, mask and breathing hose attached to seal in hood, coat and hood donned. Integrity of seal tested by wearer.
11. Wearer's field of view is 85 % of normal vision, per EN 136.

Required Elements: Suit comes with integrated foot covers, eliminating the need for boots. Gloves are supplied, but can be replaced (not attached to suit). Respiratory equipment is also a required element for ensemble.

OPERATIONAL

CAs Protected Against: NFPA 1994 Class 2 CA permeation resistance and limited vapor protection requirement (ensemble test)

BAs Protected Against: Exceeds NFPA 1994 by providing “systems level” aerosol threat protection

TIMs Protected Against: Meets NFPA 1994 Class 2/3 liquid and/or gas permeation resistance requirements

Duration of Protection: >4 h; mustard gas >12 h (per FMV: A 53739)

All chemical testing done as per Fixperm X10, ASTM F739 and EN 374. CE Approval per EN 374 and EN 420 was performed by FORCE Dantest (CE 0200):

- Acrolein— >480 min
- Acrylonitrile— >480 min
- Allylamine—15 min
- Ammonia—110 min
- Carbon disulfide— >480 min
- Chlorine— >240 min
- Chloroacetone— >240 min
- Ethylene oxide— >240 min
- Formaldehyde (37 %)— >240 min
- Hydrogen cyanide— >240 min
- Nitric acid, fuming—100 %—180 min

Ensemble Application: IDLH environments or atmosphere with less than 19.5 % oxygen concentration; radiation; and biological. Expected primary use is CB agent protection and PPE for use with most common industrial chemical spills.

Flame Resistance: Not flame resistant but can withstand temperatures of 593 °C (1100 °F) for significant periods of time, but not fire retardant

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 0.998 kg (2.2 lb)

Ensemble weight (plus components): 2.99 kg (6.6 lb)

Unit area weight of material used: 115 g/m² (4.85 oz/yd²)

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has not been conducted

Construction: Four welded seams

Colors: Minimum order for color is 10 000

Dexterity: Not specified

Visual Acuity/Visibility: Better than or equal to 20/35

FOV: 85 % per EN 136

Don/Doff: No assistance is required for donning/doffing. Takes trained user ~3 min to don ensemble.

Operational Limitations: Temperature range: -20 °C to 70 °C (-4 °F to 158 °F) (no impact on material or protection). Not in temperatures above—593 °C (1100 °F) (material degradation).

MCC Capability: Cooling vests are available for use with the ensemble in warm or hot operating environments

Environmental Conditions: Ensemble has not been tested against environmental performance measures

LOGISTICS/TRAINING

TDP: Technical data package is available. User and instruction manuals are available upon written request.

Training:

- **Training Hours:** Less than 8 h provided by the manufacturer. Training documentation is available from the manufacturer. Training does not result in certification.
- **Training Required:** Not specified
- **Training Available:** Classroom/online or C/91 user training available onsite (where equipment will be used or stored)
- **Manuals Available:** User instructions are included with the ensemble

Cleanability: We recommend disposal of suits if any question of contamination exists

Cleaning Products: We recommend disposal of suits if any question of contamination exists

Use/Reuse: The suits are designed for one use

Shelf Life: >20 yr

Maintenance Required: No maintenance required unless PAPR used, then lithium batteries need to be replaced every 10 yr

Maintenance Cost: \$0

Storage Conditions: Not over 50 °C (122 °F)

Consumables: Not specified

Consumables Costs: Not specified

Package Shape/Size (Storage): Cube—Less than or equal to 0.028 m³ (1.0 ft³)

Sizes Available: One size fits all

SPECIAL PARAMETERS

Health Hazards: The ensemble presents no health or safety hazards in storage or use, if manufacturer instructions are followed

Latex/Allergens: Ensemble contains no latex or other allergen; Not specified

Communications: Ensemble has a mask-mounted wireless communications system; speech diaphragm

EOD Compatibility: Ensemble has the ability to be used with an EOD (Protective Bomb Suit) protective system

Warranty: 1 yr

GENERAL

SWEDE Butyl Coverall

Model: TST320-46960xS

Stock: TST320-46960

First Line Technology, LLC
P.O. BOX 58111
Washington, DC 20037
Randy Sakowitz
866-556-0517 (Tel)
202-249-8480 (Tel)
rsakowitz@firstlinetech.com

Manufacturer Type: Foreign—Sweden
Information Source: <http://www.firstlinetech.com>
Status: The vendor has responded—10/18/2006



NFPA Certification:

Planned for submission: Level B, NFPA 1994, NFPA 1991 with Chem-Bio Option

OSHA EPA Level:

Level B/C

NFPA Certification Number:

Not applicable

Certifying Organization:

Not applicable

Date Certified/Expected:

Planned for submission

Required Boots:

Attached booties help to reduce inward leakage by eliminating the two ankle joints on traditional coveralls. Integrated butyl sock reduces the amount of time to suit up and do not require duct tape to make up for shortfalls in the overall suit design. Double skin legs prevent water from uncomfortably pooling inside of work boots.

Required Gloves:

Interlocking butyl gloves that do not require duct taping to patch up leaks in the overall suit design.

Respiratory Equipment: The standard butyl coverall comes with a neoprene collar for tight but comfortable integration with hoods and powered air purifying respirators (PAPR). The optional hood is butyl stitched and taped onto the coverall enabling integration with full face negative air purifying respirators.

Unit Cost: \$860

Availability: In stock, or manufactured on demand. Start up is 4 wk to 6 wk for orders of 100. Small orders can be taken from stock.

References: Commerical applications: hospitals, hazmat response teams, civilians, medical response teams, and first responders

Other Certifications: The suit is certified EN 465 for chemical protective clothing, by SP in 1997

Independent Testing: EN 12941, prEN 146 by Force institute, SP, in 1996, 1997, and 1998

Material Technology: The combination of the highly impermeable butyl rubber material with the SWEDE PPE design yields this unparalleled Butyl Coverall. Sold individually or part of an integrated kit, the butyl coverall is the ultimate in protection for use during decontamination or escape. Suspenders and utility pockets make this suit both comfortable and practical for field use. Butyl coated polyester fabric, nonpermeable barrier, weight: 405 g/m², thickness: 0.32 mm.

Design/Configuration: Suit adjustability to accommodate various body types. Physical design features include: size-specific, size-adjustable, and front entry.

Ensemble Design and Description: The SWEDE Butyl Coverall offers high levels of body protection against all known BAs and CAs without compromising comfort and dexterity. As the central component of a PPE ensemble, this coverall has many features integrated into the suit design that help to increase the overall safety level.

Required Elements: Butyl coverall; pair butyl attached gloves, replaceable; cotton gloves; attached bootie worn with outer boot. No certified pass-throughs but option can be provided.

OPERATIONAL

CAs Protected Against: High levels of body protection against all known CAs

BAs Protected Against: High levels of body protection against all known BAs

TIMs Protected Against: Not specified

Duration of Protection: The Butyl Decon Kit passed the Porton Down Challenge that exposed the complete suit to battlefield concentrations of sulphur mustard vapor for a duration of four hours while attached to a mechanized mannequin
Not specified

Ensemble Application: For use in flammable or flash fire environment, or radiation and biological environments

Flame Resistance: Yes—French standard MOI 05707401.01

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 1.59 kg (3.5 lb)

Ensemble weight (plus components): 2.27 kg (5 lb)

Unit area weight of material used: 283 g/m² (11.94 oz/yd²)

Material thickness of the ensemble: 318 μ (12.5 mil)

Butyl coated polyester fabric, nonpermeable barrier, weight: 405 g/m² (14.3 oz/yd²), thickness: 0.32 mm [320 μ (12.6 mil)]

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has not been conducted

Construction: Inward leakage is prevented by many of these safety features: All seams are sewn and taped, interlocking butyl gloves, butyl taped and stitched seams, triple layer front closure, attached booties, Neoprene neck collar, and double skin legs

Colors: Gray—minimum order of 500 suits for custom colors

Dexterity: Not specified

Visual Acuity/Visibility: Not specified

FOV: FOV—>70 %

Don/Doff: No assistance is required for donning/doffing. Average donning time is 31 s to 60 s.

Operational Limitations: Not specified

MCC Capability: No pass-throughs for microclimate cooling. TST/SWEDE has its own cooling vest that is worn within the ensemble and works without ice, refrigeration, or a freezer. The cooling system recharges at room temperature and reacts off the heat of the user.

Environmental Conditions: Not specified

LOGISTICS/TRAINING

TDP: Technical data package is available. User and instruction manuals are available. Contact First Line Technology, LLC at 202-249-8480.

Training:

- **Training Hours:** Less than 8 h provided by the manufacturer. Training documentation is available from the manufacturer.
- **Training Required:** Training documentation is available from the manufacturer
- **Training Available:** Offsite (at manufacturer site) or onsite (where equipment will be used or stored). User instructions are included with the ensemble
- **Manuals Available:** User and instruction manuals are available: Contact First Line Technology, LLC at 202-249-8480

Cleanability: Ensemble can be cleaned and reused approximately 10 times to 12 times

Cleaning Products: Wash in warm wash water. Decontamination/disposal procedures are available.

Use/Reuse: Butyl coveralls are reusable

Shelf Life: 25 year (per manufacturer)

Maintenance Required: After each use and annually

Maintenance Cost: \$150

Storage Conditions: -30 °C to 40 °C (-22 °F to 104 °F). Relative humidity—50 %.

Consumables: Gloves

Consumables Costs: Not specified

Package Shape/Size (Storage): Cube—Less than or equal to 0.057 m³ (2.0 ft³)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large

SPECIAL PARAMETERS

Health Hazards: Ensemble does not contain allergens

Latex/Allergens: Ensemble does not contain latex; MSDS is not available

Communications: Ensemble has the ability to interface with a communications system

EOD Compatibility: Does not provide EOD protection

Warranty: The manufacturer warrants the equipment and materials sold to end users will be fit for its intended purpose and will be free from manufacturing defects for a period of 12 mo from the date of sale. This warranty shall not cover damages to any product resulting from (i) failure to follow operating instructions, (ii) negligence or accident, or (iii) repairs, alterations, or installation performed by any person or firm not duly authorized by manufacturer in writing; nor shall this warranty apply to any Product from which manufacturer identification number has been removed or defaced.

GENERAL

DTAPS® Level A Totally-Encapsulating Suit

Model: 10-100

GEOMET Technologies, LLC.
20251 Century Boulevard, Suite 300
Germantown, Maryland 20874-1192
Hoyt Hughes
301-428-9898 x 252(Tel)
301-428-9482 (Fax)
hhughes@geomet.com

Manufacturer Type: Domestic
Information Source: <http://www.nbcprotect.com>
<http://www.dtaps.com>
NIJ Guide for Personal Protection Equipment for Emergency
First Responders, April 2001
Status: The vendor has not responded 2/26/2004

**NFPA Certification:**

Not specified

OSHA EPA Level:

Level A

NFPA Certification Number:

Not applicable

Certifying Organization:

Not specified

Date Certified/Expected:

Not specified

Required Boots:

Onguard Industries—Hazmax (87012)

Required Gloves:

Not specified

Respiratory Equipment: Not specified**Unit Cost:** \$630 Level A suit**Availability:** 4 wk to 6 wk**References:** USMC; USAF medical teams; U.S. Capitol Police; U.S Customs Service; U.S. State Dept.; New Castle County, Delaware**Other Certifications:** 29 CFR 1910.120**Material Technology:** Not specified**Design/Configuration:** Front entry

Ensemble Design and Description: The Level A suit features a panoramic view 3-layer visor (40 mil PVC/5 mil FEP/20 mil PVC), vapor-tight zipper with 2 ply double splash flaps, 2 Auer exhaust valves with elastomer splash covers and fabric splash guards, an expanded SCBA pod, attached gloves (with glove ring and worm gear clamp), and integral booties with boot splash flaps. Suit includes 24 mil neoprene/butyl gloves and Silver Shield/4H chemical resistant glove liners.

Required Elements: Not specified

OPERATIONAL

CAs Protected Against: NFPA 1992, 2005 Edition equal to NFPA 1994 Class 1 CA permeation [100 g/m² (4.2 oz/yd²)] liquid, vapor and aerosol CAs. Suit material provides over 12 h of protection against chemical agents GA, GB, GD, HD, L, and VX when tested in accordance with MIL-STD-282, Methods T-208 and T-209 at 10 g/m²; agents GB, HD and VX also provide over 12 h of protection when tested at 100g/m²; suit material seams provide over 4 h of protection against GB when tested in accordance with MIL-STD-282, Method 206.1.3 (full coverage).

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats). Material is protective against bacteria, protozoan, rickettsia, toxins, and viruses. Biopenetration resistance testing in accordance with ASTM F 1671, Standard Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Blood-Borne Pathogens Using Phi-X174 Bacteriophage Penetration as a Test System.

TIMs Protected Against: Suit material is protective against the 21 chemicals listed in ASTM F 1001 and numerous other TIMs when tested in accordance with ASTM F 739. Permeation data is available for more than 250 chemicals. For specific chemicals, refer to DuPont's Permeation Guide for Tychem Fabrics and the DuPont Tyvek Fax-on-Demand Data Service (800-558-9329).

Duration of Protection: At least 8 h from a material protection standpoint (except as noted below); mission duration will generally be limited by breathing air supply. Suit material provides over 12 h of protection against CW agents GA, GB, GD, HD, L, and VX when tested in accordance with MIL-STD-282, Methods T-208 and T-209 at 10 g/m²; agents GB, HD and VX

also provide over 12 h of protection when tested at 100 g/m²; suit material seams provide over 4 h of protection against GB when tested in accordance with MIL-STD-282, Method 206.1.3 (full coverage).

Dichloromethane—432 min; methanol—157 min; and ammonia gas—46 min

Ensemble Application: Military, Federal, State, and local first responders to CB incidents, including IDLH and confined space entry and mitigation operations

Flame Resistance: Not recommended for use in with fused munitions or in explosive or flammable atmosphere

HUMAN FACTORS

Ensemble Weight: 3.2 kg (7 lb); unit area weight of material used: 156 g/m² (6.6 oz/yd²)

Comfort ASTM: None available at this time

Construction: Seams are sewn then overtaped with heat-sealed tape

Colors: Olive drab green

Dexterity: Glove system passed the NFPA 1994 Glove Hand Function Test (Section 8.18); the criteria for passing is average % increase over barehanded control of less than 600 % (test is pass/fail so there is no specific value for the test results)

Visual Acuity/Visibility: 3-layer panoramic view visor measures ~74 cm (29 in) wide by 44.5 cm (17.5) in high; anti-fog compound provided with each suit

FOV: Reduction 15 %. NOTE: this reported reduction in field of view is due solely to the respirator facemask; the suit has a panoramic view visor, which does not further reduce the field of view.

Don/Doff: One assistant required for donning. The system can be doffed by the user, but an assistant would be beneficial. Don/doff time is less than 10 min.

Operational Limitations: In higher temperatures, responders should be limited from 30 min to 45 min work

MCC Capability: A pass-through is available for use with and optional personal ice cooling system

Environmental Conditions: The suit can be operated under all common outdoor weather conditions and climates (rain, snow, high temperatures, humidity, etc.). Tychem LV material stays flexible even at sub zero temperatures.

LOGISTICS/TRAINING

TDP: Not specified

Training:

- **Training Hours:** 2 h for operation
- **Training Required:** 2 h for operation
- **Training Available:** Yes, initial operating training is available
- **Manuals Available:** Commercial operating/instruction user manual

Cleanability: This garment is designed for one operational use

Cleaning Products: NFPA 1994 material

Use/Reuse: This garment is designed for one operational use

Shelf Life: 5 yr (per manufacturer)

Maintenance Required: Annual visual inspection and pressure testing

Maintenance Cost: None

Storage Conditions: Between 4 °C and 49 °C (40 °F and 120 °F). Store in a cool, dry, dark location free of insects. Sunlight, ozone, high temperatures, vehicle exhaust fumes, compression under heavy weights, and sharp objects or projections can degrade suits. Suits should be stored in their original boxes, in bags, or on hangers.

Consumables: If using optional cooling system, 3 size D alkaline batteries and ice are consumable items

Consumables Costs: Not specified

Package Shape/Size (Storage): Package size is 56 cm x 56 cm x 28 cm (22 in x 22 in x 11 in); volume is 0.088 m³ (3.1 ft³)

Sizes Available: Small, medium, large, X-large, XX-large, and XXX-large

SPECIAL PARAMETERS

Health Hazards: All materials are considered nonhazardous. MSDS on Tychem LV available upon request. Contaminated suits should be treated as hazardous waste and must be disposed of in accordance with established procedures, regulations, and laws. Contaminated suits should be landfilled in an approved manner, but can be incinerated.

Latex/Allergens: Not specified; MSDS on Tychem LV available upon request

Communications: DTAPS Level A Suit is compatible with various commercial radio systems, such as the optional intrinsically safe DWIS radio system

EOD Compatibility: DTAPS Level A suit should not be used in explosive or flammable atmospheres or with fused munitions

Warranty: 90 d from date of invoice for defects in material and workmanship. Complete warranty information is stated in the operating/instruction manual.

GENERAL

Disposable Toxicological Agent Protective Suit (DTAPS®) System

Model: 10-400

GEOMET Technologies, LLC.
20251 Century Boulevard, Suite 300
Germantown, Maryland 20874-1192
Hoyt Hughes
301-428-9898 x 252(Tel)
301-428-9482 (Fax)
hhughes@geomet.com

Manufacturer Type: Domestic
Information Source: <http://www.nbcprotect.com>
<http://www.dtaps.com>
<http://www.geomet.com>
Status: The vendor has not responded 2/26/2004



Level B

NFPA Certification:

Not specified

OSHA EPA Level:

Level B

NFPA Certification Number:

Not applicable

Certifying Organization:

Not specified

Date Certified/Expected:

Not specified

Required Boots:

Not specified

Required Gloves:

Not specified

Respiratory Equipment: Not specified**Unit Cost:** Not specified**Availability:** Not specified**References:** U.S. Air Force

Material Technology: The fabric used in the DTAPS® Level C1 suit, Tychem® LV, is an improved version of one of DuPont's commercial fabrics.

DuPont Barricade (3 mil Tychem LV)—an impermeable nonwoven multi-laminate material

Physical Properties of Tychem® LV:

Basis weight (ASTM D 3776)—156 g/m² (6.6 oz/yd²)

Thickness (ASTM D 1777)—406 μ (16 mil)

Ball burst (ASTM D 3787)—400 N (90 lbf)

Grab tensile (ASTM D 3776)—400 N (90 lbf) (md), 374 N (84 lbf) (cd)

Trapezoidal tear (ASTM D 5597)—84 N (19 lbf) (md), 84 N (19 lbf) (cd)

Design/Configuration: Not specified

Ensemble Design and Description: The suit provides protection against dual-use industrial chemicals and CB agents. Close-fitting adjustable neck dam, liquid-resistant zipper assembly with 2-ply double splash flaps, attached neoprene/butyl gloves, integral booties with boot splash flaps incorporated into suit; ensemble includes custom-fit reusable chemical splash hood.

Required Elements: Not specified

OPERATIONAL

CAs Protected Against: Equal to NFPA 1994 Class 2 CA permeation [droplet 10 g/m² (0.42 oz/yd²)]. Suit material provides over 12 h of protection against chemical agents GA, GB, GD, HD, L, and VX when tested in accordance with MIL-STD-282, Methods T-208 and T-209 at 10 g/m² (0.42 oz/yd²); agents GB, HD and VX also provide over 12 h of protection when tested at 100g/m²; suit material seams provide over 4 h of protection against GB when tested in accordance with MIL-STD-282, Method 206.1.3 (full coverage). Suit material tested against the following:

GA (<0.0001 μg/cm²)

GB (<0.0001 μg/cm²)

GD (<0.0001 μg/cm²)

HD (<1.000 μg/cm²)

L (<0.060 μg/cm², 12 h and <0.042 μg/cm², 2 h)

VX (<0.0001 μg/cm²)

All tests conducted in triplicate for DuPont Nonwovens by an independent accredited laboratory at 22EC, 50 % rh

* Fabric test protocols:

A–MIL–STD–282, Method T–209 for HD (or modified for L) for 12 h at 10 g/m².

B–MIL–STD–282, Method T–209 for HD (or modified for L) for 12 h at 100 g/m² (total coverage).

C–MIL–STD–282, Method T–208 for GB (or modified for GA, GD, and VX) for 12 h at 10 g/m².

D–MIL–STD–282, Method T–208 for GB (or modified for GA, GD, and VX) for 12 h at 100 g/m² (total coverage).

BA's Protected Against: Suit material is protective against bacteria, protozoans, rickettsia, toxins, and viruses. Biopenetration resistance is measured in accordance with ASTM F1671, Standard Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Blood-Borne Pathogens Using Phi-X174 Bacteriophage Penetration as a Test System.

TIMs Protected Against: Suit material is protective against the 21 chemicals listed in ASTM F 1001 and numerous other TIMs. Permeation data is available for more than 250 chemicals. For specific chemicals, refer to DuPont's Permeation Guide for Tychem Fabrics and the DuPont Fax-on-Demand Data Service (800–558–9329).

Duration of Protection: At least 8 h from a material protection standpoint (except as noted below). Suit material provides over 12 h of protection against CW agents GA, GB, GD, HD, L, and VX when tested in accordance with MIL–STD–282, Methods T–208 and T–209 at 10 g/m²; agents GB, HD and VX also provide over 12 h of protection when tested at 100 g/m²; suit material seams provide over 4 h of protection against GB when tested in accordance with MIL–STD–282, Method 206.1.3 (full coverage).

Dichloromethane—432 min

Methanol—157 min

Ammonia gas—46 min

Ensemble Application: Military, Federal, State, and local responders to chemical and biological terrorism incidents in non-IDLH situations. The Level C1 system is targeted for use in field missions of up to 8 h in duration. The Level C1 DTAPS® is used where there are vapors or gases that are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin (i.e., the contaminants do not represent a severe skin hazard). In addition, the Level C1 suit is used when the concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air-purifying respirators are met (for example, filter canisters that can remove the contaminants present are available). The Level C1 system is designed for field use by personnel such as EMS, police, fire department, decontamination teams, security personnel, and forensics teams. It is not for use in atmospheres that are immediately dangerous to life or health.

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Flame Resistance: Not specified

HUMAN FACTORS

Ensemble Weight: 1.2 kg (2.7 lb)

Not specified

Comfort ASTM: Not specified

Construction: DuPont has developed a new seam sealing tape for use with the Tychem® LV fabric. This combination delivers a superior chemical barrier combined with physical strength, durability, and enhanced comfort and flexibility. Extensive chemical testing has been conducted by DuPont and GEOMET to evaluate and document the performance of both the material and seams to ensure continued excellent chemical protection.

Colors: A dull green color (i.e., olive drab) was specified at the request of users to provide a lower on scene profile compared to the high visibility suit colors normally used for hazardous waste operations

Dexterity: Glove system passed the NFPA 1994 Glove Hand Function Test (Section 8.18); the criteria for passing the test is average % increase over barehanded control of less than 600 % (test is pass/fail so there is no specific value for the test results)

Visual Acuity/Visibility: Not specified

FOV: Field of View greater than 70 % of natural field of view. Reduction 10 %. NOTE: this reported reduction in field of view is due solely to the respirator facemask; the suit does not have an integral hood and the splash hood does not further reduce the field of view.

Don/Doff: "Buddy" required for donning. The system can be doffed by the user. The Level C1 ensemble features fully integrated subsystems. Suit presents minimal restrictions on mobility and flexibility.

Operational Limitations: In hot environments, operations can be extended with the optional cooling system to manage heat stress

MCC Capability: The equipment is designed to operate under all common environmental conditions and climates. Tychem® LV material stays flexible even at sub-zero temperatures.

Environmental Conditions: The equipment is designed to operate under all common environmental conditions and climates. Tychem® LV material stays flexible even at sub-zero temperatures.

LOGISTICS/TRAINING

TDP: Not specified

Training:

- **Training Hours:** 2 h for operation
- **Training Required:** 2 h for operation
- **Training Available:** Yes
- **Manuals Available:** Commercial operating manual

Cleanability: This garment is designed for one operational use

Cleaning Products: NFTA 1994 material

Use/Reuse: The manufacturer has not conducted any suit integrity testing beyond a single operational wear. However, the user organization has the prerogative to determine the integrity of each suit not subjected to a toxic or unknown chemical exposure and to make its own determination as to whether or not a second or subsequent additional operational wears are safe for the user. If the suit passes a visual inspection, the responsible safety professional may, at his/her discretion, approve use of the suit for subsequent Hazmat operations. It is the responsibility of the safety officer or other responsible safety professional having jurisdiction to determine the issues and circumstances concerning suit reuse. Level C1 suit must be disposed of after any toxic chemical exposure (liquid or vapor).

This suit must be removed from operational service if any one of the following are met:

- Suit is abraded, cut, torn, punctured, or otherwise breached in any way (i.e., it fails the visual inspection).
- Suit has been exposed to a toxic chemical.
- Suit has been exposed to an unknown chemical.
- Suit has had prolonged exposure to intense heat and/or ultraviolet radiation (sunlight).

If not contaminated by a toxic or unknown chemical during emergency operations, the Level C1 suit can be downgraded for reuse as a training suit. When a suit no longer passes the visual inspection, it can also be downgraded to a training suit.

Shelf Life: 5 yr (per manufacturer)

Maintenance Required: Annual visual inspection

Maintenance Cost: None

Storage Conditions: Between 4 °C and 49 °C (40 °F and 120 °F). Store in a cool, dry, dark location free of insects. Sunlight, ozone, high temperatures, vehicle exhaust fumes, compression under heavy weights, and sharp objects or projections can degrade suits. Suits should be stored in their original boxes, in bags, or on hangers.

Consumables: 4 cfm PAPR blower requires two filter canisters and lithium battery pack (can be stored for up to 10 yr). Optional cooling system requires three size D alkaline batteries, which will last up to 4 h, and ice.

Consumables Costs: Not specified

Package Shape/Size (Storage): Rectangle 41 cm x 25 cm x 41 cm (16 in x 10 in x 16 in). NOTE: suits come 2 per box.

Sizes Available: Small, medium, large, X-large, XX-large, and XXX-large

SPECIAL PARAMETERS

Health Hazards: All materials are considered nonhazardous. MSDS on Tychem LV material available upon request. Contaminated suits should be treated as hazardous waste and must be disposed of in accordance with established procedures, regulations, and laws. Contaminated garments should be landfilled but can be incinerated.

Latex/Allergens: Not specified; MSDS on Tychem LV available upon request

Communications: Not specified

EOD Compatibility: Not specified

Warranty: 90 d from date of invoice for defects in materials and workmanship. This warranty does not apply to damage or injury resulting from accident, misuse, neglect, or from alteration of any accessories or support equipment. It is the user's responsibility to use reasonable care in maintaining, operating, and storing DTAPS™. See commercial operating/instruction manual for complete warranty information.

GENERAL

Disposable Toxicological Agent Protective Suit (DTAPS®) System

Model: 10-500

GEOMET Technologies, LLC.
20251 Century Boulevard, Suite 300
Germantown, Maryland 20874-1192
Hoyt Hughes
301-428-9898 x 252(Tel)
301-428-9482 (Fax)
hhughes@geomet.com

Manufacturer Type: Domestic
Information Source: <http://www.geomet.com>
<http://www.nbcprotect.com>
NIJ Guide for Personal Protection Equipment for Emergency
First Responders. April 2001
Status: The vendor has not responded 2/26/2004



NFPA Certification:
Not specified

OSHA EPA Level:
Level B

NFPA Certification Number:
Not applicable

Certifying Organization:
Not specified

Date Certified/Expected:
Not specified

Required Boots:
Not specified

Required Gloves:
Not specified

Respiratory Equipment: Not specified

Unit Cost: Not specified
Availability: Not specified
References: U.S. Air Force

Other Certifications: 29 CFR 1910.120

Independent Testing: Tested with U.S. Army TOP 10-2-022 methyl salicylate (MeS) man-in-simulant test (MIST), yielding an average overall protection factor of 630 (i.e., the suit protects against CA simulant on average 630 times better than with no suit).

Material Technology: The fabric used in the DTAPS® Level C2 suit is DuPont's Tychem® SL Barricade, an impermeable nonwoven multi-laminate material (5 mil Tychem Dip). Tychem® SL material offers the lightweight protection of Tyvek® laminated with a chemical-resistant Saranex® film. This combination delivers effective protection against a broad range of chemicals and makes a lightweight, comfortable garment at an economical price.

Physical properties of Tychem® SL include:

Basis weight (ASTM D 3776)—83 g/m² (3.5 oz/yd²)

Thickness (ASTM D 1777)—330 μ (13 mil)

Mullen burst (ASTM D 3786)—503 kPa (73 psi)

Breaking strength grab (ASTM D 5034)—47 lb (md), 50 lb (cd)

Trapezoidal tear (ASTM D 1117)—4.08 kg (9 lb) (md), 3.63 kg (8 lb) (cd)

Design/Configuration: Not specified

Ensemble Design and Description: The Level C2 DTAPS® system is designed for short-duration missions where liquid splash or direct contact with hazardous chemicals is unlikely. The suit provides protection against dual-use industrial chemicals and CB agents.

Required Elements: Not specified

OPERATIONAL

CAs Protected Against: Suit material provides over 3 h of protection against HD; over 6 h of protection against GB and L; and over 12 h of protection against VX when tested in accordance with MIL-STD-282, Methods T-208 and T-209 at 10 g/m².

Equal to NFPA 1994 Class 2 CA permeation [droplet 10 g/m² (0.42 oz/yd²)].

All tests conducted in triplicate for DuPont Nonwovens by an independent accredited laboratory at 22 EC, 50 % R.H. Fabric test protocols:

A–MIL–STD–282, Method T–209 for HD (or modified for L) at 110 g/m² (0.42 oz/yd²) in 10 µL drops.

C–MIL–STD–282, Method T–208 for GB (or modified for VX) at 10 g/m² (0.42 oz/yd²) in 10 µL drops.

Suit material tested against the following:

GB (<0.00012 µg/cm²)

HD (<0.10000 µg/cm²)

L (<0.10000 µg/cm²)

VX (<0.00012 µg/cm²)

BAAs Protected Against: Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats). Suit material provides excellent resistance against blood, body fluids, and viral contaminants and is protective against bacteria, protozoans, rickettsia, toxins, and viruses. The material passes ASTM F 1670 for synthetic blood penetration and also passes biopenetration resistance when tested in accordance with ASTM F1671, Standard Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Blood-Borne Pathogens Using Phi-X174 Bacteriophage Penetration as a Test System.

TIMs Protected Against: Suit material is protective against most of the 21 chemicals listed in ASTM F 1001 (except for carbon disulfide, dichloromethane, ethylene oxide, tetrachloroethylene, tetrahydrofuran, and toluene). Tychem® SL is also protective against numerous other TIMs. Permeation data is available for more than 250 chemicals. For specific chemicals, refer to DuPont's Permeation Guide for Tychem Fabrics and the DuPont Fax-on-Demand Data Service (800–558–9329).

Duration of Protection: Generally 8 h from a material protection standpoint (except as noted below), Suit material provides over 3 h of protection against CW agent HD; over 6 h of protection against agents GB and L; and over 12 h of protection against agent VX when tested in accordance with MIL–STD–282, Methods T–208 and T–209 at 10 g/m² (0.42 oz/yd²).

Acetone—24 min

Acetonitrile—12 min

Ammonia gas—32 min

Diethylamine—12 min

N, N-dimethylformamide—112 min

Ethyl acetate—14 min

n-hexane—146 min

Nitrobenzene—102 min

Carbon disulfide, dichloromethane, ethylene oxide (gas), tetrachloroethylene, tetrahydrofuran, and toluene—immediate (less than 10 min)

Ensemble Application: Military, Federal, State, and local responders to chemical and biological terrorism incidents in non-IDLH situations. The Level C2 system is targeted for use in short-duration missions (4 h or less) in situations that meet the criteria for using an air-purifying respirator. This system can be used for emergency medical response and for other emergency services where liquid splash or direct contact with hazardous chemicals is unlikely. Although designed primarily for hospital use by doctors and nurses, the ensemble is ideal for remediation, environmental clean-up operations, clean room applications, hazardous materials response teams, and in radioactive environments.

Flame Resistance: Not specified

HUMAN FACTORS

Ensemble Weight: <1 kg (1.75 lb)

330 µ (13 mil) Tychem® SL, which utilizes Saranex® 23–P coextruded barrier film laminated to Tyvek® (spunbonded olefin)

Comfort ASTM: Not specified

Construction: 13 mil Tychem® SL, which utilizes Saranex® 23–P coextruded barrier film laminated to Tyvek® (spunbonded olefin). Suit seams are serged with texturized polyethylene thread, then sealed with Dow Saranex® seam seal tape. Extensive chemical testing has been conducted by DuPont and GEOMET to evaluate and document the performance of both the material and garment seams to ensure continued excellent chemical protection. Close-fitting adjustable neck dam, zipper assembly with 2-ply double splash flaps, attached 16 mil butyl gloves, integral booties. Ensemble includes a powered air hood.

Colors: White

Dexterity: Not specified

Visual Acuity/Visibility: Not specified

FOV: Field of view greater than 70 % of natural field of view. Reduction 10 %. NOTE: this reported reduction in field of view is due solely to the respirator hood; the suit does not have an integral hood and the splash hood does not further reduce the field of view.

Don/Doff: Not specified

Operational Limitations: In hot environments, operations can be extended with the optional cooling system to manage heat stress

MCC Capability: Not specified

Environmental Conditions: The equipment is designed to operate under all common environmental conditions and climates. Tychem® SL material is rugged and durable, even in cold temperatures. The material offers little change in stiffness when exposed to extreme cold temperatures 20 °C (68 °F) down to -65 °C (-85 °F), as measured per ASTM D 747.

LOGISTICS/TRAINING

TDP: Not specified

Training:

- **Training Hours:** 2 h for operation
- **Training Required:** 2 h for operation
- **Training Available:** Yes
- **Manuals Available:** Commercial operating manual

Cleanability: Not specified

Cleaning Products: Can be wiped down

Use/Reuse: The manufacturer has not conducted any suit integrity testing beyond a single operational wear. Level C2 suit must be disposed of after any liquid or vapor chemical exposure.

Removal from operational service: This suit should be removed from operational service after one use.

Decontamination/disposal: If the suit is contaminated by any liquid or vapor chemical exposure, it should be treated as hazardous waste. The recommended disposal method is to immerse the suit in household bleach (5 % solution) for 24 h. After 24 h, the suit should then be landfilled, but can be incinerated in accordance with all applicable Federal, State, and local laws and regulations.

Shelf Life: 5 yr (per manufacturer)

Maintenance Required: Annual visual inspection

Maintenance Cost: None

Storage Conditions: Between 4 °C and 49 °C (40 °F and 120 °F). Store in a cool, dry, dark location free of insects. Sunlight, ozone, high temperatures, vehicle exhaust fumes, compression under heavy weights, and sharp objects or projections can degrade suits. Suits should be stored in their original boxes, in bags, or on hangars.

Consumables: 6 cfm PAPR blower requires three filter canisters six size D alkaline batteries. Optional cooling system requires three size D alkaline batteries, which will last up to 4 h, and ice.

Consumables Costs: Not specified

Package Shape/Size (Storage): Rectangle 38 cm x 26 cm x 27 cm (15 in x 10.25 in x 10.5 in). NOTE: suits come 2 per box.

Sizes Available: Small, medium, large, X-large, XX-large, and XXX-large

SPECIAL PARAMETERS

Health Hazards: All materials are considered nonhazardous. MSDS on Tychem DP material available upon request. Contaminated suits should be treated as hazardous waste and must be disposed of in accordance with established procedures, regulations, and laws. Contaminated garments should be landfilled but can be incinerated.

Latex/Allergens: Not specified; MSDS on Tychem DP available upon request

Communications: Not specified

EOD Compatibility: Not specified

Warranty: 90 d from date of invoice for defects in materials and workmanship. This warranty does not apply to damage or injury resulting from accident, misuse, neglect, or from alteration of any accessories or support equipment. It is the user's responsibility to use reasonable care in maintaining, operating, and storing DTAPS™. See commercial operating/instruction manual for complete warranty information.

GENERAL

CLD100 Protective Coverall

Model: CLD100.29001

Paul Boyé
1564 route de Legardelle
31880 LE VERNET
France
+(33) 5 34 48 21 11 (Tel)
+(33) 5 34 48 21 15 (Fax)

Manufacturer Type: Foreign—French
Information Source: <http://www.paulboye.com>
BTG Technologies LLC
Francis (Butch) Brochu via
fbrochu@btgtechnologies.com
443-910-3477 (Cell)
410-939-0817 (Fax)
Status: The vendor has responded—5/15/2006

NFPA Certification:

European certification prEN14605:200

OSHA EPA Level:

Level B

NFPA Certification Number:

Not applicable

Certifying Organization:

IFTH (France)

Date Certified/Expected:

Not applicable

Required Boots:

Not specified

Required Gloves:

Not specified

Respiratory Equipment: Not specified**Unit Cost:** \$70 to \$100 (depending on design and quantity requests)

Call Paul Boyé export department for a quotation

+(33) 5 34 48 21 11 (Tel)

+(33) 5 34 48 21 15 (Fax)

Availability: 8 wk lead time—4000 suits/mo**References:** French army and civil defense. Contact: Center d' Etudes du Bouchet.

Attention: Mr. Stephan, BP N 3, 91710 Vert-le-Petit

+(33) 1 69 90 84 17 (Tel)

+(33) 1 64 93 52 66 (Fax)

Other users: Swiss Army and civil defense, Singapore Army and civil defense, Belgium army, Israel civil defense, and several NATO member countries

Other Certifications: European certification prEN 1511. CA certifications (France, Netherlands, Swiss).**Independent Testing:** Data testing info from EN14605:2004**Material Technology:** Paul Boyé Patented Fabrics—multilayer thermoplastic barrier laminated on a supporting nonwoven fabric**Design/Configuration:** Front entry**Ensemble Design and Description:** One-piece suit impermeable military suit for use with SBCA and mask (nonwoven with barrier complex)**Required Elements:** Not specified

OPERATIONAL

CAs Protected Against: Equal to NFPA 1994 Class 2 CA permeation [droplet 10 g/m² (0.42 oz/yd²)]. Material was successfully tested following ISO 16603 which is based on ASTM F 1671 standard.Nerve agent—protection over 24 h with liquid VX [10g/m² (0.42 oz/yd²)] following NATO standard method.Blister Agent—Protection over 24 h with liquid HD (Mustard) (10g/yd²m) following NATO standard method. For specific test results call Paul Boyé export department: +(33) 5 34 48 21 11 (Tel) or +(33) 5 34 48 21 15 (Fax).**BAs Protected Against:** Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats)**TIMs Protected Against:** Excellent protection against a wide variety of TIM's. Permeation tests according EN 374-3 show agreement with NFPA 1994 1991/1992 ASTM F 1001 Class 2/3 except for ammonia (35 min resistance instead of 60 min).

Duration of Protection: 2 h; nerve agent protection over 24 h with liquid. The mission duration in contaminated area is reduced to 2 h because of the risk of heat-stress damages, not because of a lack of protection. Excellent protection against a wide variety of TIMs.

Tested following EN 374-3-1994

Sodium hydroxide—>8 h

Sulfuric acid—>8 h

Nitric acid—>8 h

Acetonitrile—>8 h

n-Hexane—>8 h

Toluene—>8 hr

Trichloroethylene—>4 h

Isooctane—>8 h

Xylene—>8 h

Chlorine gas—>8 h

Ensemble Application: Chemical and biological incidents

Flame Resistance: Not recommended in flammable environment

HUMAN FACTORS

Ensemble Weight: 0.6 kg (1.32 lb)

Unit area weight of material used: 120 g/m² (5.1 oz/yd²)

Comfort ASTM: Not specified

Construction: Each seam is welded and heat-sealed with tape. This construction leads to a very high level of protection and to high mechanic resistance in the seam areas. Total length of seams for the complete suit is approximately 16 linear m.

Colors: Standard colors include NATO green, white, and orange. All plain colors are available.

Dexterity: Not specified

Visual Acuity/Visibility: The hood is adapted to the face shield of gas mask and does not reduce the visibility. Fogging has no impact.

FOV: Not applicable

Don/Doff: Average time in less than 60 s for donning and/or doffing; assistance is not required

Operational Limitations: Directly related to the physical conditions of the user and the weather conditions. Compatible with all commercial cooling devices.

MCC Capability: Not applicable

Environmental Conditions: Can be used in all conditions of weather and climates. Rain, snow, extreme temperatures or humidity do not affect the suit. Not in flammable conditions.

LOGISTICS/TRAINING

TDP: Not specified

Training:

- **Training Hours:** No special training required
- **Training Required:** No special training required
- **Training Available:** Not applicable
- **Manuals Available:** Don/Doff manual is included in each suit package

Cleanability: Not specified

Cleaning Products: Not specified

Use/Reuse: Limited use (disposal of the suit if contaminated, or reusable after visual inspection). The suit can be decontaminated with shower systems or equivalent. After decontamination, the suit must be stored in sealed bags and destroyed (by incineration).

Shelf Life: 10 yr

Maintenance Required: Visual inspection prior to use

Maintenance Cost: Not specified

Storage Conditions: Temperature: -10 °C to 40 °C (14 °F to 104 °F). Relative Humidity: 20 % to 80 %.

Consumables: Not specified

Consumables Costs: Not specified

Package Shape/Size (Storage): 10 cm x 30 cm x 35 cm (4 in x 12 in x 14 in)

Sizes Available: Small, medium, large, X-large, XX-large, and XXX-large

SPECIAL PARAMETERS

Health Hazards: Not applicable

Latex/Allergens: Not applicable; Not applicable

Communications: Easy interface with communications system worm under the hood (pass-through connections need special adaptations)

EOD Compatibility: Not applicable

Warranty: Free of material and workmanship defects for 10 yr before first use

GENERAL**SEA Tyvek® F Single-Use Suit and Hood****Model:** 50104**Stock:** Large (50104); Hood (50138)

Safety Equipment America, Inc. (The SEA Group)
 11 Business Park Drive
 Branford, Connecticut 06405
 Bengt Kjellberg, President
 203-483-9483 (Tel)
 888-732-3500 (Tel) (Toll Free U.S. and Canada)
 203-483-6633 (Fax)
 bengtk@sea.com.au

Manufacturer Type: Foreign**Information Source:** <http://www.sea.com.au>

Brochure and Internet

Status: The vendor has responded—10/18/2006**NFPA Certification:**

No third-party certifications in RKB for this Product

OSHA EPA Level:

Level B

NFPA Certification Number:

Not applicable

Certifying Organization:

Not applicable

Date Certified/Expected:

Not applicable

Required Boots:

Not specified

Required Gloves:

Not specified

Respiratory Equipment: SE400, breath responsive, computerized positive pressure PAPR**Unit Cost:** \$236**Availability:** Commercial**References:** California National Guard (Capt. Poteat 916-417-7910)

New York State Emergency Management (John Gibb 518-485-9169)

Massachusetts Emergency Management (David Ladd 978-567-3117)

Other Certifications: Tyvek F models typically surpass the minimum performance requirements specified in the European standards. For detailed information call 888-832-3500.**Independent Testing:** Specification available on request. Call 888-732-3500 and ask for document regarding Tyvek Barrier Man Chemical Protective Clothing.**Material Technology:** Tyvek® F (high-density polyethylene) is manufactured by laminating the basic Tyvek® flash-spunbonded polyethylene material to a barrier film which is coated with a polymer. The top polymer layer allows seams to be made with a heat-sealing tape which includes the same barrier film and polymer as Tyvek® "F." Known CAs will not permeate these seams.**Design/Configuration:** Front entry**Ensemble Design and Description:** The SEA Tyvek® F positive-pressure suit is especially made for the SE400, breath responsive, computerized positive pressure PAPR, with optional integrated personal ice cooling system. One unique feature of the SE-SHIELD suit is that it can be used with a pressurization hose which turns the suit into a positive pressure suit. Inward leakage into the suit if using pressurization hose is typically 0.1 %.**Required Elements:** Each suit is vacuum packed with the following items: SE-Shield disposable suit, cotton inner gloves for comfort, and user instructions**OPERATIONAL****CAs Protected Against:** Tested by U.S. Army SBCCOM Edgewood Biological and Chemical Center, Aberdeen Proving Ground, MD. For additional information see Army reporthttp://www.ecbc.army.mil/downloads/reports/se_shield_suit_se400_papr.pdf.**BAs Protected Against:** http://www.sea.com.au/html/products/pospress/datasheet/ds_se4_suit_dp.htm**TIMs Protected Against:** http://www.sea.com.au/html/products/pospress/datasheet/ds_se4_suit_dp.htm**Duration of Protection:** Not specified

Ensemble Application: Used to protect the entire body while wearing the SE400 respirator. Protects against particles and gases. Ideal for decontamination work and investigation of suspected chemical and biological threats such as anthrax, etc.

Flame Resistance: Not specified

HUMAN FACTORS

Ensemble Weight: Complete suit is 0.68 kg (1.5 lb); suit ventilation system is an additional 0.23 kg (0.5 lb)

Comfort ASTM: Not specified

Construction: Heat-sealed seams

Colors: Green

Dexterity: Not specified

Visual Acuity/Visibility: Not specified

FOV: Not specified

Don/Doff: There is no assistance required for the donning or doffing of the SEA suit. An experienced operator can comfortably don or doff within 2 min.

Operational Limitations: The SEA suit is very lightweight with positive pressure and suit cooling capability option; therefore, there is little additional workload so the user can perform normal work for longer periods without suffering discomfort, even in high-temperature environments

MCC Capability: Suit cooling capability option

Environmental Conditions: http://www.sea.com.au/html/products/pospress/datasheet/ds_se4_suit_dp.htm.

LOGISTICS/TRAINING

TDP: Not specified

Training:

- **Training Hours:** Less than 8 h provided by the manufacturer. No specific training required other than to read the manual. Basic operational understanding takes 15 min. Further training is required for the user to understand the maintenance and care of the SE400.
- **Training Required:** No specific training required other than to read the manual. Basic operational understanding takes 15 min. Further training is required for the user to understand the maintenance and care of the SE400.
- **Training Available:** SEA can provide full training for use, maintenance, and care of the SEA suit. See instruction http://www.sea.com.au/docs/manuals/se-shield_tyvek_instr.pdf
- **Manuals Available:** Training documentation including DVD tape available

Cleanability: Suit is one-time use. Cannot be cleaned and reused.

Cleaning Products: Not applicable

Use/Reuse: The ensemble is disposable. The Tyvek F garments could be incinerated after use without harming the environment, or they may be buried in a responsible way.

Shelf Life: The projected shelf life of Tyvek "F" fabrics based on accelerated aging tests according to ASTM 573-88 conducted at 100 °C (212 °F) and 100 psi is 5 yr

Maintenance Required: Maintenance not required

Maintenance Cost: None

Storage Conditions: Store in a dry location and avoid direct contact with sunlight for prolonged periods. When stored correctly and with packaging seal unbroken, storage life of 5 yr to 10 yr can be expected.

Consumables: Disposable Suit

Consumables Costs: Not specified

Package Shape/Size (Storage): 23 cm x 30.5 cm x 20 cm (9 in x 12 in x 8 in)

Sizes Available: Large, X-large, XX-large, and XXX-large

SPECIAL PARAMETERS

Health Hazards: Not specified

Latex/Allergens: Not specified; Not specified

Communications: SE-TALK—a miniature loudspeaker that connects to the respirator unit as well as the positive-pressure suit cooling system

EOD Compatibility: Not specified

Warranty: The supplier warrants that all products manufactured by it shall be free of defects in material and workmanship for a period of 1 yr from the date of delivery

GENERAL

S/89 and Military Survival Kit

Model: S/89

Stock: S/89 and Military Survival Kit

New Pac Safety AB
PO Box 174
SE-566 23 Habo, Sweden
+46 36 411 39 (Tel)
+46 36 410 31 (Fax)
info@newpac.se

Manufacturer Type: Foreign—Sweden and other European countries

Information Source: Homeland Security PPE Direct (North American Importer), an Operating Unit of Shoreline Associates, Inc.

PO Box 41
1163 Foxon Road
North Branford, Connecticut 06471-0041
203-484-4600 (Tel)
203-484-4692 (Fax)

<http://www.HomelandSecurityPPEDirect.com>

MAmatrudo@HomelandSecurityPPEDirect.com

Status: The vendor has responded—5/17/2005

**NFPA Certification:**

Military

OSHA EPA Level:

Level B

NFPA Certification Number:

Not applicable

Certifying Organization:

Not applicable

Date Certified/Expected:

Not applicable

Required Boots:

Integrated boots

Required Gloves:

Integrated gloves

Respiratory Equipment: Not specified**Unit Cost:** \$76**Availability:** In stock**References:** To be provided

Other Certifications: Meets NATO Military Standards for NBC Ensemble; Swedish

Independent Testing: Defense Lab Certification. Battelle Labs—Test GD and HD (July 27, 1990).

Material Technology: Thermoplastic film technology (advanced, co-extruded, multi-layer, thermoplastic films are converted into several different, patented disposable garment designs by special heat sealing technique). Body cover—50 μ (1.97 mil) thin, transparent polyethylene (PE) film. The PE has a polyamide (PA) barrier. Foot covers—made from nonwoven polypropylene (PP) fiber fabric reinforcements.

Design/Configuration: Suit is adjustable to accommodate various body types

Ensemble Design and Description: Two-piece encapsulating clear protective overgarment for use in tactical operations, CBRN response teams, medical response teams, and decontamination team. Designed for temporary and short-term use by personnel and to protect general population.

1. One size fits all.
2. Packaged to be very light and take up minimal space.
3. Over 1 000 000 suits in service around the world.
4. Quick donning; protective envelope attained within 10 s.
5. Clear to distinguish from enemy.

Required Elements: Both footwear and gloves are integrated into the ensemble. Attached gloves are nonreplaceable. There are no certified pass-throughs.

OPERATIONAL

CAs Protected Against: Equal to NFPA 1994 Class 2/3 CA permeation resistance [droplet 10 g/m² (0.42 oz/yd²)]

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats)

TIMs Protected Against: Less penetration protection but some level provided

Duration of Protection: Mustard gas protection >10 h

Data not available

Ensemble Application: Explosive atmospheres and biological

Flame Resistance: Not flame resistant

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 0.23 kg (0.5 lb)

Ensemble weight (plus components): 1.13 kg (2.5 lb) with mask and carrying bag

Unit area weight of material used: 180 g/m² (7.59 oz/yd²)

Material thickness of the ensemble: 50 µm (2 mil)

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has not been conducted

Construction: Four welded seams

Colors: Minimum order for color is 10 000

Dexterity: Not specified

Visual Acuity/Visibility: Better than or equal to 20/35

FOV: 85 %

Don/DoFF: No assistance is required for donning/doffing. Average donning time is 0 s to 30 s.

Operational Limitations: Operating temperature: -20 °C to 65 °C (-4 °F to 149 °F) operating range

MCC Capability: Ensemble has the ability to be used with a microclimate cooling system

Environmental Conditions: Ensemble has not been tested against environmental performance measures

LOGISTICS/TRAINING

TDP: Technical data package is available. User and instruction manuals are available.

Training:

- **Training Hours:** Less than 8 h provided by the manufacturer. Training documentation is available from the manufacturer. Training does not result in certification.
- **Training Required:** Not specified
- **Training Available:** Classroom/Online—S/89 User Training—Onsite (where equipment will be used or stored)
- **Manual/CD/Video—S/89 Donning and Use Video—CD and video**
- **Manuals Available:** User instructions are included with the ensemble

Cleanability: Garment is disposable

Cleaning Products: Garment is disposable

Use/Reuse: The suits are designed for one use

Shelf Life: >20 yr

Maintenance Required: No maintenance required, other than replacement of CBRN filter canister, if included in kit

Maintenance Cost: None

Storage Conditions: Not over 40 °C (104 °F)

Consumables: Not specified

Consumables Costs: Not specified

Package Shape/Size (Storage): Cube—Less than or equal to 0.028 m³ (1.0 ft³)

Sizes Available: One size fits all

SPECIAL PARAMETERS

Health Hazards: The ensemble presents no health or safety hazards in storage or use, if manufacturer instructions are followed

Latex/Allergens: Ensemble contains no latex or other allergen; Not available

Communications: Not available

EOD Compatibility: Currently being worn over EOD protective equipment

Warranty: 1 yr

GENERAL

Spiratec® Hybrid
Model: Not applicable

Texplorer®GmbH
 Van-der-Upwich Strasse 37
 41334 Nettetal
 Germany
 Ms Lore Leimer
 0 1149-2153-9540 0 (Tel)
 0 1149-2153-9540 70 (Fax)
 lore.leimer@explorer.de
 info@explorer.de

Manufacturer Type: Foreign—German
Information Source: <http://www.texplorer.de/>
Status: The vendor has responded—5/2/2005



NFPA Certification:
 Military

OSHA EPA Level:
 Level B

NFPA Certification Number:
 Not applicable

Certifying Organization:
 Not applicable

Date Certified/Expected:
 Not applicable

Required Boots:
 AirBoss Lightweight CBRN Overboot specification dated 11
 June 2004 (Air Boss Defense/Canada)

Required Gloves:
 Rex Gummitechnik—Germany
 Rex Article No. 6186-0,6

Respiratory Equipment: Not specified

Unit Cost: Garments are manufactured individually according to different specifications. Price depends on amount of garments, size distribution, and requirements.

Availability: Manufactured on demand

References: Spiratec Hybrid is a brand-new product and is currently evaluated in France, Belgium, Sweden, Germany, Spain, U.S.A., and by various small user groups

Other Certifications: Suit has not yet been subjected to other certification testing

Independent Testing: TNO Laboratories, The Netherlands. Test(s) conducted—CA tests (GD, GB, HD, and VX) with and without treatments, new and used. Test Date(s): 2003 and 2005.

- Dual Flow Mustard Test on unworn material— $<0.4 \mu\text{g}/\text{cm}^2$
- Dual Flow Mustard Test on 3 x washed material— $1.5 \mu\text{g}/\text{cm}^2$
- Dual Flow Mustard Test on 6 x washed material— $2.1 \mu\text{g}/\text{cm}^2$
- Dual Flow Mustard Test on 9 x washed material— $0.5 \mu\text{g}/\text{cm}^2$
- Dual Flow Mustard Test on 12 x washed material— $0.5 \mu\text{g}/\text{cm}^2$
- Dual Flow GD Test on unworn material— $<0.4 \mu\text{g}/\text{cm}^2$
- Dual Flow GB Test on unworn material— $0.5 \mu\text{g}/\text{cm}^2$
- Dual Flow GA Test on unworn material— $<0.4 \mu\text{g}/\text{scm}^2$
- Dual Flow VX Test on unworn material— $<0.4 \mu\text{g}/\text{cm}^2$
- Dual Flow Mustard Dry Sweat Test— $0.5 \mu\text{g}/\text{cm}^2$
- Dual Flow Wet Sweat Test— $0.3 \mu\text{g}/\text{cm}^2$
- Dual Flow HD Test on seams, 12 times laundered— $0.7 \mu\text{g}/\text{cm}^2$
- Dual Flow GD Wet Sweat— $<0.16 \mu\text{g}/\text{cm}^2$
- Dual Flow GD Sea Water Immersion— $0.9 \mu\text{g}/\text{cm}^2$
- Dual Flow HD Sea Water Immersion— $2.1 \mu\text{g}/\text{cm}^2$
- Dual Flow HD Diesel— $2.6 \mu\text{g}/\text{cm}^2$

Bio test: Penetration through the material not detectable

Material Technology: The material consists of two protective layers: layer-1 is a breathable, selectively permeable membrane. Layer-1 is bonded to layer-2, which is made of activated charcoal cloth. Both layers assist each other to give a high level of protection against chemical agents in gaseous, aerosol, and liquid state. At the same time the material is water and windproof. Biological substances as well as nuclear particles are completely blocked by the membrane. Garment is intended for use by the

military. It consists of engineered permeable material and has very interesting features for first responders, too. It provides protection especially against CB agents.

Design/Configuration: Size-specific, size-adjustable, and front entry. Suit is adjustable to accommodate various body types. Suit is adjustable to accommodate bulky equipment. Donning/doffing time and assistance is noted on label.

Ensemble Design and Description: The suit comes with a tight closure around the gas mask, which uses a sticking elastic band for a secure fit as well as protective material laid as a trap for hazardous chemicals. The garment is closed by a zipper, which has layers of protective material on top and underneath of it. For removing water or liquids from the zipper, a rain flap is added. The garment comes either as a coverall or as a two-piece garment. There is a mechanism to connect pants and jacket in the two-piece garment. Cuffs from the pants to the boots optional. The connection to the gloves is secured by a combination of Velcro tapes and elastic bands.

The ensemble has the following features:

- 1) breathable—the heat stress is much lower than in closed barrier systems—it is not required to wear a breathing apparatus, the user can stay in the suit for an extended period of time compared to Level A and B suits.
- 2) provides 100 % protection against biological and nuclear particles.
- 3) provides protection against the war agents HD, GD, GB, and VX.
- 4) is not affected by wind, rain, water from the outside.
- 5) has a high level of protection against war agents even when treated with sea water, sweat, or diesel.

Required Elements: Footwear can consist of overboots or protective socks worn inside normal boots. Various solutions possible: 1) attached bootie, 2) separate protective sock, 3) separate protective boot, or 4) overboot. Combination of thin inner cotton gloves and butyl rubber outer gloves. The ensemble is not certified for pass-throughs.

OPERATIONAL

CAs Protected Against: Equal to NFPA 1994 Class 2/3 CA permeation resistance [droplet 10 g/m² (0.42 oz/yd²)]

BAs Protected Against: Refer to independent testing. All tests were conducted by TNO laboratories in the Netherlands. For details please refer to independent testing.

TIMs Protected Against: Less penetration protection but some level provided

Rad/Nuc Materials Protected Against: Barrier against radioactive particles

Duration of Protection: TICs were not tested yet. Shell fabric and membrane provide splash protection as a minimum. In the event of being contaminated, the user will have enough time to leave the high-risk zone and get out of the suit. Some TICs will be repelled for longer periods.

Ensemble Application: To be used: Flammable or flash fire environment, IDLH environments or atmosphere with less than 19.5 % oxygen concentration; biological; deep frozen media; and in the presence of CA or BA. Not to be used: Submersion in water or any other type of liquid(s); fused munitions; explosive atmospheres; radiation; cryogenic conditions, and liquefied gas conditions.

Flame Resistance: Depends on the requirement. Can be flame resistant but does not have to be.

HUMAN FACTORS

Ensemble Weight: Ensemble weight (less components): 2.18 kg (4.8 lb) (coverall)

Ensemble weight (plus components): 3.31 kg (7.3 lb)

Unit area weight of material used: 315 g/m² (13.3 oz/yd²) (liner material plus shell fabric)

Material thickness of the ensemble: ~102 μ to 508 μ (4 mil to 20 mil)

Comfort ASTM: ASTM F 1154 qualitative evaluation for comfort, fit, function, and integrity has not been conducted for the ensemble. The breathability of the garment was determined in the laboratory according to ISO 11092. The Ret value is 11.96 m² Pa / W, which means good breathability. Ret values from 1 to 6 are considered as very good, from 7 to 13 as good, from 14 to 20 as acceptable, and above 20 as not breathable.

Construction: The seams of the shell fabric are sewn, and the seams of the liner are sewn and taped. Number of seams depends on the construction of the garment and the construction depends on requirements.

Colors: Color coding is available. Minimum quantity required for color coding is 200 garments.

Dexterity: Not applicable

Visual Acuity/Visibility: Better than or equal to 20/35. A visor is not part of the garment, acuity depends on the gas mask that is worn.

FOV: Minimum of 80 %, depending on the gas mask

Don/Doff: No assistance needed for donning or doffing. Time depends on training between 30 s and 180 s.

Operational Limitations: Temperatures above 43 °C (110 °F) can cause heat stress. In temperatures below -23 °C (-10 °F), vapor pressure of chemicals too low to cause harm.

MCC Capability: The system is breathable. It does not necessarily need a pass-through. However, in the event it is required, a pass-through can be designed specifically to the user's need.

Environmental Conditions: Test was not conducted but temperatures down to -25 °C (-13 °F) should not cause a problem

LOGISTICS/TRAINING

TDP: A general technical description is available. Send an enquiry to info@texplorer.de.

Training:

- **Training Hours:** Less than 8 h not provided by the manufacturer, although training can be provided by the manufacturer. Training documentation can be prepared if required.
- **Training Required:** Training documentation can be prepared if required
- **Training Available:** Not specified
- **Manuals Available:** Includes donning, doffing, maintenance, laundering, and repairing

Cleanability: It can be laundered according to JSLIST laundering specifications a minimum of 8 times

Cleaning Products: As specified in MIL-DTL.32102

Use/Reuse: If garments are contaminated with CBA, they need to be disposed after doffing. If garments are contaminated with TICs it depends on the toxicity and volatility of the TIC whether and when the garment can be worn again.

Shelf Life: 6 yr to 10 yr

Maintenance Required: Maintenance is not required but ensembles need to be checked visually before and after each use

Maintenance Cost: Not applicable

Storage Conditions: Temperature range: -18 °C to 60 °C (0 °F to 140 °F). Relative humidity range: 0 % to 100 % (garments come vacuum packed).

Consumables: Gloves and boots should be replaced whenever the garments get replaced

Consumables Costs: Not specified

Package Shape/Size (Storage): Oblong—Less than or equal to 0.057 m³ (2.0 ft³)

Sizes Available: Two-piece: X-small, small short, small regular, medium short, medium regular, medium long, large regular, large long, and X-large

Coverall: small short, small regular, medium regular, medium long, large regular, large long, X-large regular, and X-large long

SPECIAL PARAMETERS

Health Hazards: Ensemble does not contain latex or any other known allergens

Latex/Allergens: Ensemble does not contain latex; The material is certified according to Oeko Tex Standard 100, Product Class II, for materials that are worn in contact with skin. The material does not cause any harm or allergies. For further details check www.oeko-tex.com.

Communications: Garment has no communication interface, but the design can be changed and interfaces can be included individually

EOD Compatibility: No EOD compatibility

Warranty: A warranty can only be given if it is exactly known what kind of user group will wear the garments in what kind of situations

GENERAL

Saratoga Joint Service Lightweight Integrated Suit (JSLIST)

Model: 415-01-444-XXXX

Stock: 415-01-444-XXXX (depending on size and color)

Tex-Shield, Inc.
5206 Morrowick Road
Charlotte, North Carolina 28226
Nona Fahl
704-341-3681 (Tel)
704-341-3468 (Fax)
nfahl@aol.com
info@texshield.com

**Manufacturer Type:** Domestic and Foreign**Information Source:** Tex-Shield, Inc.

DOD—Joint Services

Marine Corps System Command

Quantico, Virginia 22134

Mr. Doug Bryce

703-784-6675

Status: The vendor has responded—5/27/2005**NFPA Certification:**

Military

OSHA EPA Level:

Not applicable

NFPA Certification Number:

Not applicable

Certifying Organization:

DOD certification. DOD certified material per PD97-04.

Date Certified/Expected:

Not applicable

Required Boots: Not specified**Required Gloves:** Not specified**Respiratory Equipment:** Not specified**Unit Cost:** Available on request**Availability:** Fielded April 1997. Currently in production.**References:** Department of Defense—Joint Services Marine Corps System Command

Quantico, Virginia 22134

POC: Mr. Doug Bryce

703-784-6675

Other Certifications: Provides protection from CAs per MIL-DTL-32102. Tex-Shield, Inc., is sole source for material for JSLIST overgarment.**Independent Testing:** Meets requirements of MIL-DTL-32102. Independent test data/certificate of compliance is available upon request.**Material Technology:** Permeable Saratoga™ carbon sphere sorptive technology. Two-layer fabric system. The inner filter layer is composed of carbon spherical absorbers fixed to a lightweight polyester knit. The outer layer is composed of a woven rip stop 50/50 nylon/cotton with an oil and water repellent finish. Filter fabric features Saratoga™ activated carbon spheres fixed to polyester tricot.**Design/Configuration:** Not specified**Ensemble Design and Description:** Overgarment (OG), a universal lightweight, two-piece, front-opening garment can be worn as an overgarment or as a primary duty uniform over personal underwear. It has an integral hood, bellows-type pockets, high-waist trousers, adjustable suspenders, adjustable waistband, and waist length jacket. Low thermal burden, less bulk; lightweight design offers improved mission effectiveness.**Required Elements:** Chemical warfare protective mask, gloves, and socks or overboots. Polyethylene storage bag. Suit may be purchased as package with Saratoga gloves and socks.

OPERATIONAL

CAs Protected Against: Protects against all classes of CAs as specified in MIL-DTL-32102, when used as directed with chemical warfare protective mask, gloves, and overboots or socks**BAs Protected Against:** Protects against BAs as specified in MIL-DTL-32102 when used as directed with appropriate mask, gloves, and overboots or socks

TIMs Protected Against: Not tested

Duration of Protection: Between 60 min and 119 min. Meets the requirements of MIL-DTL-32102 for protection from chemical warfare agents for up to six launderings, 45 d wear, 120 calendar d after removal from factory sealed bag or 24 h after contamination.

Not specified

Ensemble Application: Military, tactical, crisis management, all law enforcement, and first responders

Flame Resistance: Not specified

HUMAN FACTORS

Ensemble Weight: Varies by size. Nominal weight: 2.27 kg to 3.18 kg (5 lb to 7 lb) suit.

Not specified

Comfort ASTM: Not specified

Construction: Seam sealing not required in Saratoga garments

Colors: Woodland or desert camouflage

Dexterity: Not specified

Visual Acuity/Visibility: Not specified

FOV: Not specified

Don/Doff: Average time for donning and/or doffing is between 61 s and 3 min. Assistance is not required. Assistance in checking mask/hood interface is recommended. Suspenders, drawstring cords, and Velcro closures for easy donning.

Operational Limitations: Durable garment with long wear life. Meets 24 h chemical protection requirements after 45 d field wear and 6 launderings. Low thermal burden and high level of protection allow for extended wear time.

MCC Capability: Not specified

Environmental Conditions: No environmental usage limitations. Suitable for use in all climatic conditions.

LOGISTICS/TRAINING

TDP: Not specified

Training:

- **Training Hours:** No special training required. Standard training should include donning, doffing contaminated garments, and inspection procedures.
- **Training Required:** Standard training should include donning, doffing contaminated garments, and inspection procedures
- **Training Available:** JSLIST training video is available from manufacturer
- **Manuals Available:** Instruction manual

Cleanability: Suit is launderable 6 times for hygienic purposes. Standard home or industrial laundering can be used.

Cleaning Products: Not specified

Use/Reuse: Reusable and launderable. Dispose of contaminated suits in a safe and approved manner.

Shelf Life: 14 yr

Maintenance Required: Required general suit inspection, standard laundering, record wear use, and laundering; but no testing required. Inspection for tears and damage is required.

Maintenance Cost: None

Storage Conditions: Not specified

Consumables: None

Consumables Costs: Not specified

Package Shape/Size (Storage): Coat and trouser packaged separately. Nominal 25 cm x 15 cm x 7 cm (10 in x 6 in x 3 in) compact vacuum-sealed package for each piece.

Sizes Available: Small/X-short, small/short, medium/short, medium/regular, medium/long, large/regular, large/long, X-large/regular, X-large/long, XX-large/long, and XXX-large/long

SPECIAL PARAMETERS

Health Hazards: Ensemble does not contain latex or any other known allergens

Latex/Allergens: Ensemble does not contain latex; No MSDS

Communications: Not applicable

EOD Compatibility: Compatible with EOD equipment in CB environment

Warranty: Free of material and workmanship defects for 1 y

GENERAL

Saratoga™ HAMMER Suit**Model:** TSCN0756-XX-size**Stock:** TSCN0756-XX-size (XX designates BC for coats and BT for trousers)

Tex-Shield, Inc.
 5206 Morrowick Road
 Charlotte, North Carolina 28226
 Nona Fahl
 704-341-3681 (Tel)
 704-341-3468 (Fax)
 nfahl@aol.com
 info@texshield.com

**Manufacturer Type:** Domestic and Foreign**Information Source:** Tex-Shield, Inc.

DOD—Joint Services
 Marine Corps System Command
 Quantico, Virginia 22134
 Mr. Doug Bryce
 703-784-6675

Status: The vendor has responded—5/27/2005**NFPA Certification:**

Military

OSHA EPA Level:

Not applicable

NFPA Certification Number:

Not applicable

Certifying Organization:

Not applicable

Date Certified/Expected:

Not applicable

Required Boots:

Not specified

Required Gloves:

Not specified

Respiratory Equipment: Not specified**Unit Cost:** Available on request**Availability:** Fielded in 1998. Currently in production.**References:** Department of Defense—Joint Services Marine Corps System Command
Quantico, VA 22134**POC:** Mr. Doug Bryce
703-784-6675**Other Certifications:** Provides protection from chemical warfare agents per MIL-C-29462. Tex-Shield is sole source for all material used in SARATOGA™ HAMMER Suit.**Material Technology:** Chemical protective overgarment, duty uniform**Design/Configuration:** Not specified**Ensemble Design and Description:** Chemical protective overgarment, duty uniform**Required Elements:** Not specified

OPERATIONAL

CAs Protected Against: Protects against all classes of CAs as specified in MIL-C-29462 when used as directed with chemical warfare protective mask, gloves, and overboots or socks**BAs Protected Against:** Protects against BAs as specified in MIL-C-29462 when used as directed with chemical warfare protective mask, gloves, and overboots or socks**TIMs Protected Against:** Not tested**Duration of Protection:** Between 60 min and 119 min. Meets the requirements of MIL-C-29462 for protection from CAs for up to six launderings, 45 d wear, 120 calendar d after removal from factory sealed bag or 24 h after contamination.

Not specified

Ensemble Application: Tactical, crisis management, all law enforcement, and first responders**Flame Resistance:** Not specified

HUMAN FACTORS

Ensemble Weight: Not specified
Comfort ASTM: Not specified
Construction: Not specified
Colors: Not specified
Dexterity: Not specified
Visual Acuity/Visibility: Not specified
FOV: Not specified
Don/Doff: Not specified
Operational Limitations: Not specified
MCC Capability: Not specified
Environmental Conditions: Not specified

LOGISTICS/TRAINING

TDP: Not specified
Training:

- **Training Hours:** Not specified
- **Training Required:** Not specified
- **Training Available:** Not specified
- **Manuals Available:** Instruction manual

Cleanability: Not specified
Cleaning Products: Not specified
Use/Reuse: Not specified
Shelf Life: Not specified
Maintenance Required: Not specified
Maintenance Cost: None
Storage Conditions: Not specified
Consumables: None
Consumables Costs: Not specified
Package Shape/Size (Storage): Not specified
Sizes Available: Small/X-short, small/short, medium/short, medium/regular, medium/long, large/regular, large/long, X-large/regular, X-large/long, XX-large/long, and XXX-large/long

SPECIAL PARAMETERS

Health Hazards: Ensemble does not contain latex or any other known allergens
Latex/Allergens: Ensemble does not contain latex; No MSDS
Communications: Not applicable
EOD Compatibility: Compatible with EOD equipment in CB environment
Warranty: Free of material and workmanship defects for 1 yr

GENERAL

Frontliner CBRN Ensemble

Model: Ensemble 001

Remploy Frontline,
Unit A, 24 Kelvin Road
Wallasey, Merseyside, CH44 7JW
United Kingdom
0845 241 2990 (Tel)
0845 241 2991 (Fax)
frontline@remploy.co.uk

Manufacturer Type: Foreign—UK**Information Source:** <http://www.rememployfrontline.co>

RKB website

Sarah Dorrance

Remploy Frontline

1800 Diagonal Road, Suite 600

Alexandria, Virginia 22314

703-647-7408 (Tel)

703-647-7409 (Fax)

Status: The vendor has responded—10/17/2006**NFPA Certification:**

NFPA 1994 Class 3, 2001 Edition

OSHA EPA Level:

LEVEL B/C

NFPA Certification Number:

CBT REM 01

Certifying Organization:

SEI

Date Certified/Expected:

January 2006

Required Boots:

Onguard Hazmax Boots

Required Gloves:

Saint-Gobain ONEGlove (recommended)

Respiratory Equipment: Avon. FMI2 Respirator and FR64 Filter (required)**Unit Cost:** ~\$1.5K**Availability:** Ensembles are manufactured on demand. Average lead time 20 wk.**References:** United Kingdom Police Force 34,228 ensembles over 3 yr

Chief Superintendent, Paul Forbes, 02070356640 (Tel)

Other Certifications: Geomet Technologies, LLC: Chemical/CWA, Permeation Testing, to NFPA 1994 (2001 Edition); test date 02 November 2005, Report No; 1753.001-REM

Intertek Testing Services: Performance Testing to NFPA 1994 (2001 Edition); test date 21 March 2006, Report No. 3085480-001

Independent Testing: Intertek Testing Services: Performance testing to NFPA 1994 (2001 Edition)

Material and ensemble testing for overall suit function and integrity, burst strength, puncture propagation tear strength, cold temperature performance, seam breaking strength, and closure breaking strength. Test date: 21 March 2006

Material Technology: The following materials are used in the manufacture of the Frontliner ensemble:

Cooler base-layer is constructed from smart fabric (Outlast) for active heat management

Britannia mid-layer is constructed from two fabrics: 1) Outer is an adsorbitive carbon C-Knit fabric; 2) Inner is a lightweight polymer composite bio-layer

Peeler outer-layer is constructed from a tri-laminate of 95 % meta-aramid/5 % para-aramid face fabric plus Eptfe membrane plus 100 % aramid backing fabric, and it is inherently fire retardant. The fabric is moisture vapor permeable and waterproof, and with the inclusion of the Eptfe membrane, enhances the level of biological protection.

Design/Configuration: Size specific (6 sizes plus special measures)

Conforms to body

Rear entry on Britannia mid-layer

Front entry on Peeler outer-layer

Ensemble Design and Description: The Cooler base-layer is a two-piece garment (Vest / Longjohns) produced in a Jersey Knit SMART fabric, this garment being a stretch fabric, will accommodate various body types.

The Britannia mid-layer is designed as a one piece garment with a rear entry; the cuffs of the sleeves, and the Bottom of the trouser legs have attached butyl seals for increased protection and the ability to accommodate various arm and leg lengths; the hood has an attached butyl seal that will fit all three sizes of the Avon FM12 respirator.

The Peeler outer-layer is designed as a one piece garment with a front entry. The rear waist of the garment is elasticated to accommodate various waist measurements. The cuffs of the sleeves are provided with Velcro strap adjusters. The bottom of the trouser legs are elasticated, with side zip closures and internal plackets to aid the fitting of protective boots.

Required Elements: Footwear: Oguard Hazmax Boots (nonattached boots replaceable)

Gloves: St Gobain ONEGlove (nonattached glove replaceable)

Respirator: Avon FM12 Respirator

No certified pass-throughs

OPERATIONAL

CAs Protected Against: NFPA 1994 CLASS 2/3 CA, Vapor Ensemble Plus Additional CA Protection

BAs Protected Against: Meets NFPA 1994 ASTM 1671-03 Liquid Agent Contamination Test.

Carried out by Geomet Technologies. Report Date, 03 June 2005

TIMs Protected Against: Meets NFPA 1994 Class 2/3 Liquid Permeation Resistance Requirements

Rad/Nuc Materials Protected Against: The Frontliner ensemble has the capability to provide protection against alpha radiological particulates

Duration of Protection: 2 h to 4 h. The specified standard working time within the Frontliner ensemble is 2 h with a safety margin of 100 %. The NFPA 1994 (2001 Edition) standard is based upon protection capabilities of no more than 1 h. EC Type-examination ratification to the CR1 ensemble.

Ensemble Application: The Frontliner ensemble is designed specifically with the civil emergency professional in mind. The ensemble is a permeable Class 3 CBRN system. Based upon a tri-layer arrangement of protective materials, these provide, base layer control of heat stress build-up, enhanced chemical liquid splash, vapor and biological spore protection, plus a superior Nomex® flame retardant capability.

Recommended uses: tactical operations, law enforcement, decontamination, medical, crisis management, and cordon control.

Not recommended uses: flammable or flash fire environments, submersion in water/or other liquid, fused munitions, explosive atmospheres, IDLH environments or atmospheres, cryogenic conditions, liquified gas, and deep frozen media.

Flame Resistance: Fire retardant, not flame resistant

HUMAN FACTORS

Ensemble Weight: Peeler (large)—1.7 kg (3.75 lb); Britannia—1.4 kg (3.08 lb)

Material thickness—0.85 mm [850 μ (34 mil)]

Peeler—0.24 kg/m² (8.3 oz/yd²); Britannia: 0.21 kg/m² (7.25 oz/yd²)

Comfort ASTM: Yes

Construction: 5 mm lock stitch sewn seams and hot melt taped

Colors: Standard color is navy blue. Minimum order quantities will apply for other solid colors and camouflage.

Dexterity: Hand function (% bare-handed control)

NFPA requirement 300 min, result <200

Visual Acuity/Visibility: Not applicable

FOV: Not applicable

Don/Doff: Assistance from buddy/partner required for closure of rear entry zip on Britannia under coverall, and to confirm respirator fit to face seals

Operational Limitations: Limitations on length of time at various temperatures: The Cooler base layer is a heat management control layer, intended to reduce the physiological burden in extreme temperature conditions.

MCC Capability: No appropriate pass-through is provided for a micro climate cooling system.

The Cooler base layer is a jersey-knitted base layer made from dedicated SMART materials. It provides an efficient heat management solution, helping dissipate excess body heat while minimizing the accrual of heat stress.

Environmental Conditions: The material used for the construction of the Peeler outer garment is a Nomex trilaminate that is inherently fire retardant is moisture vapor permeable, and waterproof.

The material is compliant with section 7.3.2.5 (cold temperature performance) of NFPA 1994 (2001 Edition) having been tested at Intertek, Report no: 3085480-001

The recommended gloves, St Gobain ONEGlove™, have independent certification to NFPA 1991, NFPA 1992, and NFPA 1994

LOGISTICS/TRAINING

TDP: There is a technical data package available. User/instruction manual provided with each ensemble. The respirator is supplied with a FM12 NBC Respirator handbook.

Training:

- **Training Hours:** <8 h, provided by the manufacturer
- **Training Required:** Training is required
- **Training Available:** Frontliner training: classroom simulated environment. Onsite.
- **Manuals Available:** Yes. User manuals are provided with each ensemble.

Cleanability: Cooler base layer may be washed as normal underwear

Britannia inner coverall can be washed up to 6 times

Peeler outer coverall can be washed or dry cleaned up to 10 times

Cleaning Products: Cooler layer uncontaminated: Machine wash, warm [40 °C (104 °F)], with like colors. Do not use bleach; tumble dry, medium heat. Do not iron.

Britannia layer may be laundered up to 6 times at 40 °C delicate, using either of the following detergents: Laundry detergent bleach (FSD 7930) Specification No. NCTRF/PD11-85A. US National No 7930-01-236-7290; Type 11 detergent (nonphosphate): P-D-245 US National Stock No 7930-00-252-679. The recommended concentration of detergent is 1 g/L (0.033 oz/qt). It is recommended that the Britannia garment be tumble dried. Incorrect laundering can have a detrimental effect on the adsorptive properties of the underoverall. It is important that the laundry process be carefully monitored by the implementation of an effective Quality Assurance programme. This should involve the periodic sampling of laundered garments and their submission for chemical agent testing. In this case the undergarment should be tested in combination with the Peeler outer garment. This garment should not be laundered more than 6 times unless adequate test data indicates that it is safe to do so this will only become evident after extensive QA testing.

Peeler layer (garment) may be laundered or dry cleaned 10 times provided the following recommendations are adhered to: 10 wash cycles at 60 °C (140 °F) according to EN26 330, method 2A. Dry cleaning; 10 cycles, ISO 3175. Garment may be tumble dried; garment may be ironed (warm iron). Observe the following when washing: Do not use bleach. Do not combine with other products. Do not combine heavily soiled garments with others. Avoid prolonged treatment at high temperatures in highly alkaline water environments. Avoid use of hard water, optimum range of water softness is between 4° and 7° to the French water hardness testing protocol. Do not use fabric softeners. Do not overload the washing machine, in order to minimize abrasion.

If the peeler layer has been contaminated with any unidentified substance or liquid, it should be treated as contaminated and appropriate undressing and disposal procedures followed.

The respirator filter Canister 3M (FR 64) is supplied with FR64 user Instructions

Bicomponent M.V.P.Socks: (W.L.Gore): Washing; hand or machine at 40 °C (104 °F), rinse thoroughly. After washing, tumble drying is recommended at a warm setting. Steam iron at a cool setting. Do not use bleach. Always check the information contained on the laundering label affixed to the socks before washing.

The garment labeling should always be followed in preference to the information provided above.

Onguard Hazmax Knee Boots: refer to manufacturer's instructions

Saint Gobain Hazmat Gloves: refer to manufacturer's Instructions

Use/Reuse: The ensemble garment elements (Cooler, Britannia, and Peeler) can all be laundered, if not contaminated. If garments are contaminated they must be disposed of. Disposal must be carried out following users standard operating procedures.

Shelf Life: 10 yr

Maintenance Required: Check the Britannia and Peeler layers thoroughly before each use for signs of damage or excessive wear and tear. The fabrics should be intact and in good repair. If tears or holes are in evidence, the garment should be returned to the manufacturer for repair, or discarded and replaced with a new garment. Particular attention should also be paid to the Peeler garment with regard to the internal seam taping, condition of the front and leg zip closures and Velcro closures, and Britannia butyl face, wrist and ankle seals. If there are splits or signs of cracking, the garment should be discarded. If there is any doubt regarding the condition of the Frontliner ensemble, the whole garment should be returned to the manufacturer for professional inspection/repair.

Maintenance Cost: Zero

Storage Conditions: Cooler base-layer, vest, and long johns are supplied in separate self-seal poly bags and can be stored as regular underwear.

Britannia mid-layer—The Primary material of the Britannia being carbon based, should be treated with respect in terms of its possible and unnecessary exposure to everyday contaminants, e.g., dust, moisture, sunlight, etc. This will help preserve its protective capability during operational deployment.

Garments that have been worn and are not soiled, or have been laundered, should be folded loosely and kept in the self seal polythene bag originally provided with the garment, and stored in a clean atmosphere away from direct sunlight, heat and any vaporous presence. If stored in a hanging state the garment should be kept in a complete seal, dark polythene wrapping. Peeler outer layer—Garments that have been worn and are not soiled, or have been laundered, should be kept in their original re-sealable polythene bag, away from direct sunlight and excessive sources of temperature; alternatively, they may be stored hanging, covered by a dark polythene cover to inhibit UV light degradation. The operational range of temperatures that will not adversely influence the performance capabilities of the materials is between 10 °C and 40 °C (50 °F to 122 °F).

Consumables: Consumables are boots and gloves

Consumables Costs: Not applicable

Package Shape/Size (Storage): Irregular—Less than or equal to 0.085 m³ (3.0 ft³)

Sizes Available: Small, medium, large, X-large, XX-large, and XXX-large

Made to measure garments are also available and shall be sized according to requirements

Normal size—to fit height (cm)—to fit chest (cm)

160/92—155 to 165—88 to 94

170/100—165 to 175—94 to 102

180/10—175 to 185—94 to 102

190/108—185 to 195—102 to 110

200/116—195 to 205—110 to 118

210/124—205 to 215—118 to 126

SPECIAL PARAMETERS

Health Hazards: Contains latex in the face seal elastic on peeler garment

Latex/Allergens: Contains latex in the face seal elastic on peeler garment; Yes, material safety data sheets are available for all main materials

Communications: Ensemble can interface with a communication system

EOD Compatibility: Compatible with EOD equipment

Warranty: Britannia and Peeler garments have a 10 yr shelf life, in original packaging, unopened. The primary material of the Britannia being adsorbitive carbon has an out of vaccum pack wear life of 48 d.

GENERAL

ONESuit™ TEC**Model:** 1S-A-LG (Large)

Saint-Gobain Performance Plastics ChemFab
 701 Daniel Webster Highway
 Merrimack, New Hampshire 03054
 Robert T. Currier, Saint-Gobain, Protective Systems
 603-424-9000 (Tel)
 603-424-9012 (Fax)
 Peter Kirk, Product Manager
 peter.a.kirk@saint-gobain.com

Manufacturer Type: Domestic**Information Source:** <http://www.onesuittec.com/>**Status:** The vendor has responded—10/19/2006

NFPA Certification:
 NFPA 1991, 2005 Edition

OSHA EPA Level:
 Level A

NFPA Certification Number:
 VPS SGP 07

Certifying Organization:
 SEI

Date Certified/Expected:
 Not specified

Required Boots:
 OnGuard Industries—Hazmax boot (87012) sold separately from an authorized OnGuard dealer. The boots are worn over integral booties that are made of the garment material and connected directly to the suit.

Required Gloves:
 Only gloves are provided with ensemble from SGPPL

Respiratory Equipment: Any NFPA 1981 certified SCBA can be utilized

Unit Cost: \$2.1K MSRP**Availability:** Average lead time 2 wk if not in stock**References:** Product is new to market, with first deliveries to customers in 10/06

Other Certifications: Proper use is consistent with NFPA 1500 Standard on Fire Department Safety and Health Program, and 29 CFR 190.132

Material Technology: Garment barrier fabric is Challenge® NXT. It is manufactured using proprietary fluoropolymer films, produced by Saint-Gobain Performance Plastics, which are then laminated to an aramid substrate matter. The materials are inert and flame resistant and have superior permeation resistance properties.

The visor is constructed of 2-layers, Primary (inner) and Secondary (outer). The primary visor is made of 10 mil FEP and provides full chemical/biological agent protection. The secondary visor is made of either clear or tinted 20 mil flexible PVC that attaches to the suit using nickel plated snap fasteners and provides burst and tear resistant properties.

- All garment seams are stitchless. They are produced by heat welding, and then covered both sides with fluoropolymer film.
- Visor seam is a heat weld directly to the garment material.
- Gloves are attached using a ring and clamp assembly.
- Zipper is attached using thermoplastic adhesive film.

Design/Configuration: Size specific, front entry, conforms to lower half of body

Ensemble Design and Description: ONESuit TEC offers:

- Protection from exposure to chemical/biological agents and industrial chemicals in both liquid and vapor form.
- Flame and abrasion resistance without a separate over-cover.
- Comfort from soft, lightweight fabric.
- Simplified donning and doffing.
- Ease of storage and handling due to lightweight, compressible design.
- ONEGlove® Hazmat glove system, offering outstanding protection with excellent dexterity.
- Interchangeable exterior visor – allows for replacement if visual acuity is impaired, plus protection from bright light conditions with use of optional tinted visor.
- Internal belting system that secures the suit to the body for increased mobility.
- Enlarged pod area to accommodate larger SCBA systems.

Required Elements: Suit; gloves—ONEGlove® Hazmat (attached and replaceable); footwear—attached bootie worn with outer boot

ONESuit® TEC is certified to 6 SCBA pass-throughs including: Dräger, Interpiro, ISI, MSA, Survivair, and Scott

OPERATIONAL

CAs Protected Against: Protection from exposure to chemical/biological agents and industrial chemicals in both liquid and vapor form

BAs Protected Against: Protection from exposure to chemical/biological agents and industrial chemicals in both liquid and vapor form

TIMs Protected Against: Protection from exposure to chemical/biological agents and industrial chemicals in both liquid and vapor form

Rad/Nuc Materials Protected Against: Some level provided

Duration of Protection: All chemical tests were performed and passed at 8 h versus requirement of 1 h

Sarin (GB)—cumulative permeation $<1.25\mu/\text{cm}^2$ (after 1 h)—0.406 after 8 h

Distilled mustard (HD)—cumulative permeation $<4.0\mu/\text{cm}^2$ (after 1 h)—0.147 after 8 h

Hydrogen fluoride (HF)—ASTM F 739— $0.10\mu\text{g}/\text{cm}^2/\text{min}$ — >480 min

Acetone— >480 min

Acetonitrile— >480 min

Ammonia— >480

1,3-Butadiene— >480 min

Carbon disulfide— >480 min

Chlorine— >480 min

Dichloromethane— >480 min

Diethylamine— >480 min

Dimethylformamide— >480 min

Ethyl acetate— >480 min

Ethylene oxide— >480 min

Hexane— >480 min

Hydrogen chloride— >480 min

Methanol— >480 min

Methyl chloride— >480 min

Nitrobenzene— >480 min

Sodium hydroxide— >480 min

Sulfuric acid— >480 min

Tetrachloroethylene— >480 min

Tetrahydrofuran— >480 min

Toluene— >480 min

Cyanogen chloride (CK)— >480 min

Carbonyl chloride (CG)— >480 min

Hydrogen cyanide (HCN)— >480 min

Dimethyl sulfate— >480 min

Ensemble Application: Tactical operations, crisis management, medical, first receiver, first responder, decontamination missions, law enforcement, and ordnance disposal

Recommend uses include: flammable environment, fused Munitions, biological, liquefied gas conditions, IDLH environments, and submersion in water/other liquids

Flame Resistance: ONESuit® TEC passed flame resistant testing as a single-skin garment without the need for an over-cover

HUMAN FACTORS

Ensemble Weight: 4.1 kg (9 lb) suit and gloves

Challenge® NXT: (9.6 oz/yd²)

Challenge® NXT: (17 mils)

Comfort ASTM: NFPA 1991 (2005 Edition)

Construction: Suit is constructed utilizing 100 % lapped seams that are 100 % fused, without stitching, in order to provide maximum strength and chemical resistance. Estimated amount of seam length is 37 m (122 ft). Suit is constructed from 9 primary suit panels.

Colors: Lime green

Dexterity: <200 %

Visual Acuity/Visibility: Interchangeable exterior visor that allows for replacement if visual acuity is impaired and provides protection from bright light conditions with use of optional tinted visor. Better than or equal to 20/20.

FOV: No requirement in NFPA 1991 (2005 Edition). Limiting factor is the SCBA mask. Fogging will not impact the field of view, but does impact visual acuity. When fogging occurs, user simply uses a rag to wipe visor down from the inside.

Don/Doff: Suit can be donned/doffed by a single individual without assistance in <5 min

Operational Limitations: Not specified

MCC Capability: No applicable

Environmental Conditions: Garment material was tested to NFPA 1991 standard for cold temperature performance and exceeded the specified requirement

LOGISTICS/TRAINING

TDP: User guide and technical manual is provided as part of the ensemble

Training:

- **Training Hours:** 8 h
- **Training Required:** Provided by the manufacturer or manufacturers representative
- **Training Available:** SGPPL offers training through our distribution network. Approximately 30 representatives are available to users for on-site training
- **Manuals Available:** Per NFPA 1991 (2005 Edition) a user guide and technical manual is provided with each ensemble sold. It can also be downloaded from the website www.onesuittec.com.

Cleanability: Ensemble can be cleaned and reused indefinitely as long as proper care and testing is performed in accordance with NFPA 1991 to ensure compliance

Cleaning Products: Cleaning instruction are provided in the user manual and involve the use of commercially available liquid dish washing detergent and disinfectant

Use/Reuse: Suit can be decontaminated and reused. Local departmental procedures and practices should be followed.

Shelf Life: ONESuit® TEC has an indefinite shelf life in that the majority of materials are inert. In addition not liquid adhesives/cements are utilized in the manufacturing process. Therefore, if the suit is properly maintained and passes the testing required by NFPA 1991, the suit does not have a definitive shelf live.

Maintenance Required: Annual inspection and pressure testing should be performed on a yearly basis as a minimum per NFPA 1991 (2005 Edition)

Maintenance Cost: Unknown

Storage Conditions: Temperature range: 2 5°F (-4 °C) to 110 °F (43°); no specified humidity range is specified

Consumables: There are no consumables associated with the ensemble

Consumables Costs: Not applicable

Package Shape/Size (Storage): Less than or equal to 0.057 m³ (2.0 ft³). Suit is stored in canvas storage bag they allows for the suit to conform to the storage area.

Sizes Available: 1S-A-SM (small); 1S-A-MD (medium); 1S-A-LG (large); 1S-A-XL (X-large); 1S-A-2X (XX-large); and 1S-A-3X (XXX-large)

SPECIAL PARAMETERS

Health Hazards: ONESuit® TEC contains no known materials that possess potential health hazards

Latex/Allergens: ONESuit® TEC contains no known materials that possess potential health hazards; MSDS's can be made available for suit materials and components

Communications: Unknown. Each user would need to determine this capability.

EOD Compatibility: Unknown. Each user would need to determine this capability.

Warranty: SGPPL warrants to the purchaser and/or end user of the suit that the suit will be free from defects in material and workmanship for a period of 90 d from the date of purchase. SGPPL will under certain conditions offer longer warranty period based on contract requirements.

**APPENDIX E—ENSEMBLE (NOT EVALUATED)
INDEX AND DATA SHEETS**

APPENDIX E—ENSEMBLE (NOT EVALUATED) INDEX AND DATA SHEETS

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2	Lakeland Tychem TK Level A Deluxe	TK640, TK650	Lakeland Industries	E-2
3	Lakeland Tychem TK Coverall—Elastic Wrist and Ankles	TK110	Lakeland Industries	E-3
4	Lakeland Tychem TK Coverall—Attached Hood, Elastic Wrist, and Ankles	TK130	Lakeland Industries	E-4
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10	Lakeland Tychem BR Coverall— Attached Hood, Elastic Wrist, and Ankles	BR130	Lakeland Industries	E-10
11	Lakeland Tychem BR Coverall—Attached Hood, Elastic Wrist, and Attached Boots	BR150	Lakeland Industries	E-11
12	Lakeland Tychem BR Coverall—Attached Respirator Fit Hood, Elastic Wrist, and Attached Boots with Boot Flaps	BR165	Lakeland Industries	E-12
13	Lakeland Tychem BR Encapsulated Flat Back Level B Suit	BR400	Lakeland Industries	E-13
14	Lakeland Tychem SL Coverall—Elastic Wrist and Ankles	72110	Lakeland Industries	E-14
15	Lakeland Tychem SL Coverall—Attached Hood, Elastic Wrist and Ankles	72130	Lakeland Industries	E-15
16	Lakeland Tychem SL Coverall—Attached Hood, Elastic Wrist, and Attached Boots	72150	Lakeland Industries	E-16
17	Lakeland Tychem SL Coverall—Attached Respirator Fit Hood, Elastic Wrist and Attached Boots with Boot Flaps	72165	Lakeland Industries	E-17
18	Lakeland Tychem SL Encapsulated Flat Back Level B Suit	72400	Lakeland Industries	E-18
19	SEA Tyvec Suit	Not specified	Safety Equipment America, Inc. (The SEA Group)	E-19
20	JetGuard® PLUS—Military Grade Level B Protective Garment	51062 (Large)	Indutex S.p.A	E-20
21	NBC Protective Suit	M-40044-001	Safety Tech International, Inc.	E-21

GENERAL

WorkMaster Pro**Model:** R29300

Draeger Safety, Inc.
 101 Technology Drive
 Pittsburgh, Pennsylvania 15275
 Julie Malinowski
 412-788-8383 (Tel)
 412-787-2207 (Fax)
 Julie.Malinowski@draeger.com
Manufacturer Type: Foreign

Information Source: <http://www.draeger.com/>
Status: The vendor has responded—5/23/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level A

Unit Cost: \$2.7K**Material Technology:** Fabric-reinforced polyurethane material. Double seams sealed inside and out. Gas-tight glove and boot connection.**Design/Configuration:** Ensemble has front entry and is size-specific**Ensemble Design and Description:** Zipper vertical and positioned to one side at the front, glove to sleeve, and boot screw clamp over support ring**CAs Protected Against:** Not specified**BAs Protected Against:** Not specified**TIMs Protected Against:** Not specified

GENERAL

Lakeland Tychem TK Level A Deluxe

Model: TK640 (front entry), TK640W (front entry extra wide face shield), TK650 (rear entry), TK650W (rear entry face shield)

Lakeland Industries
202 Pride Lane SW
Decatur, Alabama 35602
Kendra Barclay, Technical Support
kendrab@lakeland-ind.com
800-645-9291 (Tel)
256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
National Institute of Justice (NIJ) Guide for Personal Protective Equipment for Emergency First Responders, April 2001
Federal Resources, Inc.
Robbie McWilliams
Robbie.FedResources@starband.net
<http://www.federalresources.com>
410-643-7810 (Tel)
410-643-7701 (Fax)

Status: The vendor has responded—6/8/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level A

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Inner garment is selectively permeable. Seams are sewn and heat-sealed with tape. 10 mil Teflon overlay heat sealed to 40 mil pvc visor. Eliminates moisture buildup between the two layers.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Fully encapsulated vapor-protective suit, expanded back or flat back, sealed seams inside and out, 142 cm (48 in) gas-tight zipper, double storm flap with hook and loop closure, 2-layer face shield (10 mil Teflon/40 mil pvc) standard or wide view lens, 2-layer glove combination of butyl, Silver Shield, 2 exhaust valves, attached sock boots with boot flaps, 3.8 cm (1.5 in) waist belt with 3 belt loops sewn and sealed

CAs Protected Against: NFPA 1994 Class 1 and 1991 with CB Optional Permeation Resistance

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—Biological Threats)

TIMs Protected Against: Meets 1994 plus 1991/1992 ASTM F 1001 battery of 21 chemicals

Meets NFPA 1994 Class 1 liquid/gases permeation resistance requirements

GENERAL

Lakeland Tychem TK Coverall—Elastic Wrist and Ankles

Model: TK110

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)
Status: The vendor has responded—6/8/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Inner garment is selectively permeable. Seams are sewn and heat-sealed with tape.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Coverall, collar, elastic wrist, and ankles

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance
 Nerve agents (GA, GB, GD, and VX)
 Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats
 Fabric provides protection against biological toxins and pathogens

TIMs Protected Against: Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem TK Coverall—Attached Hood, Elastic Wrist, and Ankles

Model: TK130

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)
Status: The vendor has responded—6/8/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Inner garment is selectively permeable. Seams are sewn and heat-sealed with tape.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Coverall, attached hood, elastic face, elastic wrist, and ankles

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance

Nerve agents (GA, GB, GD, and VX)

Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)

Fabric provides protection against biological toxins and pathogens

TIMs Protected Against: Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem TK Coverall—Attached Hood, Elastic Wrist, and Attached Boots

Model: TK150

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)

Status: The vendor has responded—6/8/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Inner garment is selectively permeable. Seams are sewn and heat-sealed with tape.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Coverall, attached hood, elastic face, elastic wrist, and attached boots

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance

Nerve agents (GA, GB, GD, and VX)

Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)

Fabric provides protection against biological toxins and pathogens

TIMs Protected Against: Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem TK Coverall—Attached Respirator Fit Hood, Elastic Wrist and Attached Boots with Boot Flaps

Model: TK165

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)

Status: The vendor has responded—6/8/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Inner garment is selectively permeable. Seams are sewn and heat-sealed with tape.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Coverall, attached respirator fit hood, elastic face, elastic wrist, double storm flap with hook and loop closure, attached boots with boot flaps

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance

Nerve agents (GA, GB, GD, and VX)

Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)

Fabric provides protection against biological toxins and pathogens

TIMs Protected Against: Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem TK Level B Encapsulated Suit**Model:** TK400 (front entry, flat back)

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)

Status: The vendor has responded—6/8/2005**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors**Independent Testing:** Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.**Material Technology:** Inner garment is selectively permeable. Seams are sewn and heat-sealed with tape.**Design/Configuration:** Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.**Ensemble Design and Description:** Encapsulated suit, (Level B) front entry, flat back, 122 cm (48 in) zipper, double storm flap with hook and loop closure, 20 mil pvc face shield, elastic wrists, two exhaust ports with shrouds, attached sock boots with boot flaps**CAs Protected Against:** NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance

Nerve agents (GA, GB, GD, and VX)

Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)**TIMs Protected Against:** Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem TK Level B Encapsulated Suit**Model:** TK440 (front entry, expanded back), TK450 (rear entry expanded back)

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)

Status: The vendor has responded—6/8/2005**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors**Independent Testing:** Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.**Material Technology:** Inner garment is selectively permeable. Seams are sewn and heat-sealed with tape.**Design/Configuration:** Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.**Ensemble Design and Description:** Encapsulated suit, (Level B) front entry or rear entry, expanded back, 48 in zipper, double storm flap with hook and loop closure, 20 mil pvc face shield, elastic wrists, two exhaust ports with shrouds, attached sock boots with boot flaps**CAs Protected Against:** NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance

Nerve agents (GA, GB, GD, and VX)

Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)**TIMs Protected Against:** Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem BR Coverall—Elastic Wrist and Ankles

Model: BR110

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)
Status: The vendor has responded—6/8/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Garment is selectively permeable. Seams are sewn and heat-sealed with tape.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Coverall, collar, elastic wrist, and ankles

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance
 Nerve agents (GA, GB, GD, and VX)

Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)

TIMs Protected Against: Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem BR Coverall—Attached Hood, Elastic Wrist, and Ankles

Model: BR130

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)
Status: The vendor has responded—6/8/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Garment is selectively permeable. Seams are sewn and heat-sealed with tape.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Coverall, attached hood, elastic face, elastic wrist, and ankles

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance
 Nerve agents (GA, GB, GD, and VX)
 Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)

TIMs Protected Against: Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem BR Coverall—Attached Hood, Elastic Wrist, and Attached Boots

Model: BR150

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)

Status: The vendor has responded—6/8/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Garment is selectively permeable. Seams are sewn and heat-sealed with tape.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Coverall, attached hood, elastic face, elastic wrist, and attached boots

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance

Nerve agents (GA, GB, GD, and VX)

Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)

TIMs Protected Against: Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem BR Coverall—Attached Respirator Fit Hood, Elastic Wrist, and Attached Boots with Boot Flaps

Model: BR165

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)
Status: The vendor has responded—6/8/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Garment is selectively permeable. Seams are sewn and heat-sealed with tape.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Coverall, attached respirator fit hood, elastic face, elastic wrist, double storm flap with hood and loop closure, attached boots with boot flaps

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance
 Nerve agents (GA, GB, GD, and VX)
 Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)

TIMs Protected Against: Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem BR Encapsulated Flat Back Level B Suit

Model: BR400

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)
Status: The vendor has responded—6/8/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Garment is selectively permeable. Seams are sewn and heat-sealed with tape.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Encapsulated Level B suit, rear entry, flat back, 122 cm (48 in) zipper, storm flap, 20 mil pvc face shield, elastic wrists, two exhaust ports with shrouds, attached sock boots with boot flaps

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance
 Nerve agents (GA, GB, GD, and VX)
 Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)

TIMs Protected Against: Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem SL Coverall—Elastic Wrist and Ankles

Model: 72110

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)
Status: The vendor has responded—6/8/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Garment is selectively permeable. Seams are sewn and heat-sealed with tape.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Coverall, collar, elastic wrist, and ankles

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance
 Nerve agents (GA, GB, GD, and VX)
 Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)

TIMs Protected Against: Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem SL Coverall—Attached Hood, Elastic Wrist and Ankles

Model: 72130

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)
Status: The vendor has responded—6/8/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Garment is selectively permeable. Seams are sewn and heat-sealed with tape.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Coverall, attached hood, elastic wrist, and ankles

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance
 Nerve agents (GA, GB, GD, and VX)
 Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide


BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)

TIMs Protected Against: Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem SL Coverall—Attached Hood, Elastic Wrist, and Attached Boots

Model: 72150

<p>Lakeland Industries 202 Pride Lane SW Decatur, Alabama 35602 Kendra Barclay, Technical Support kendrab@lakeland-ind.com 800-645-9291 (Tel) 256-350-3011 (Fax) Manufacturer Type: Domestic</p> <p>Information Source: http://www.lakeland.com National Institute of Justice (NIJ) Guide for Personal Protective Equipment for Emergency First Responders, April 2001 Federal Resources, Inc. Robbie McWilliams Robbie.FedResources@starband.net http://www.federalresources.com 410-643-7810 (Tel) 410-643-7701 (Fax) Status: The vendor has responded—6/8/2005</p>	
<p>NFPA Certification: Not certified and not planned for NFPA submission</p>	<p>OSHA EPA Level: Level B</p>

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Garment is selectively permeable. Seams are sewn and heat-sealed with tape.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Coverall, attached hood, elastic wrist, and attached boots

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance

Nerve agents (GA, GB, GD, and VX)

Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)

TIMs Protected Against: Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem SL Coverall—Attached Respirator Fit Hood, Elastic Wrist and Attached Boots with Boot Flaps

Model: 72165

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)
Status: The vendor has responded—6/8/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Garment is selectively permeable. Seams are sewn and heat-sealed with tape.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Coverall, attached respirator fit hood, elastic wrist, and attached boots with boot flaps

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance

Nerve agents (GA, GB, GD, and VX)

Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)

TIMs Protected Against: Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

Lakeland Tychem SL Encapsulated Flat Back Level B Suit**Model:** 72400

Lakeland Industries
 202 Pride Lane SW
 Decatur, Alabama 35602
 Kendra Barclay, Technical Support
 kendrab@lakeland-ind.com
 800-645-9291 (Tel)
 256-350-3011 (Fax)
Manufacturer Type: Domestic

Information Source: <http://www.lakeland.com>
 National Institute of Justice (NIJ) Guide for Personal
 Protective Equipment for Emergency First Responders,
 April 2001
 Federal Resources, Inc.
 Robbie McWilliams
 Robbie.FedResources@starband.net
<http://www.federalresources.com>
 410-643-7810 (Tel)
 410-643-7701 (Fax)
Status: The vendor has responded—6/8/2005

**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Not applicable—cost to be determined by distributors

Independent Testing: Consult DuPont permeation guide for certification/testing organizations. ASTM F739 permeation testing.

Material Technology: Garment is selectively permeable. Seams are sewn and heat-sealed with tape.

Design/Configuration: Suit adjustability to accommodate bulky equipment. Point of entry—front or rear entry and size-specific. Pass-through options.

Ensemble Design and Description: Encapsulated Level B suit, rear entry, flat back, 122 cm (48 in) zipper, storm flap, 20 mil pvc face shield, elastic wrists, 2 exhaust ports with shrouds, and attached sock boots with boot flaps

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991 with CB optional permeation resistance
 Nerve agents (GA, GB, GD, and VX)
 Blister agents (HD and L)

For specific test results consult the DuPont Permeation Guide

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—biological threats)

TIMs Protected Against: Excellent protection against a broad range of TIMs. Consult DuPont Permeation Guide for specific test results.

GENERAL

SEA Tyvec Suit**Model:** Not specified

Safety Equipment America, Inc. (The SEA Group)
 11 Business Park Drive
 Branford, Connecticut 06405
 Bengt Kjellberg, President
 203-483-9483 (Tel)
 888-732-3500 (Tel) (Toll Free US and Canada)
 203-483-6633 (Fax)
 bengtk@sea.com.au

Manufacturer Type: Foreign**Information Source:** <http://www.sea.com.au>**Status:** The vendor has responded—7/5/2005**NFPA Certification:**

Not certified and not planned for NFPA submission

OSHA EPA Level:

Level B

Unit Cost: Estimated cost \$60**Material Technology:** Not specified**Design/Configuration:** Suit adjustability to accommodate bulky equipment. Front or rear entry—suit comes in 4 different sizes and lengths of legs and arms can be adjusted using folding and taping technique.**Ensemble Design and Description:** The SEA Tyvec suit is pressurized by the SEA PAPR unit providing a unique design and a very good suit protection factor. As a safety feature, the maximum airflow into the suit is 30 L/min (7.9 gal/min) not to compromise the airflow to the user's lungs in case of a large hole in the suit. The SEA Tyvec suit ensemble with SE 400 hood provides excellent biological protection over all body areas.**CAs Protected Against:** Not specified**BAs Protected Against:** Not specified**TIMs Protected Against:** Not specified

GENERAL

JetGuard® PLUS—Military Grade Level B Protective Garment**Model:** 51062 (Large)

Indutex S.p.A
Via S. Francesco
8/10 20011
Corbetta (MI), Italy
+39 0297 238 711 (Te)
+39 0297 238 799 (Fax)
info@indutex.it
Manufacturer Type: Foreign

Information Source: Indutex U.S.A.
3005 West Sixth Street
Wilmington, Delaware 19805
302-351-4079
<http://www.indutexusa.com>
Responder Knowledge Database
SEI site

Status: The vendor has responded—5/1/2006

NFPA Certification:
ISO 9001:2000

OSHA EPA Level:
Level B

Unit Cost: \$30—large

Material Technology: JetGuard® PLUS garments consist of an Indutex proprietary multi-layer raw material that combines high mechanical resistance together with an excellent chemical protection performance. All JetGuard® PLUS garments are manufactured to the NATO Ensemble suit design.

Design/Configuration: Not specified

Ensemble Design and Description: Indutex is the European leader in production and sales of CBRN protective garments. As the world's leading producer of Tyvek® F garments, Indutex has perfected the NATO Ensemble production process, which is superior to a standard chemical garment ensemble. Indutex vacuum packages each garment to reduce storage size and maximize shelf life. Following the continuous needs of new protective compounds that give the highest NBC protection with a well balanced price/quality level, Indutex R&D team has created under the Topguard® Technology an innovative product line called JetGuard® PLUS.

CAs Protected Against: GD (<0.05 µg/cm²)HD (<0.13 µg/cm²)VX (<0.05 µg/cm²)

*GB, GA, and L NATO tests are not applicable because the NATO procedure doesn't take into consideration chemicals.

BAs Protected Against: Synthetic blood under hydrostatic pressure, bloodborne infective agents (Phi-X 174 bacteriophage, penetration of infecting agents by contact (>150 min), biologically contaminated aerosols, and biologically contaminated powders.

TIMs Protected Against: Suit material is protective against most chemicals

GENERAL

NBC Protective Suit**Model:** M-40044-001

Safety Tech International, Inc.
A Subsidiary of TVI Corporation
5703 Industry Lane
Frederick, Maryland 21704
U.S.A.

301-624-5600 (Tel)

888-744-6462 (Tel)

301-624-5688 (Fax)

sales@safetytechint.com

Manufacturer Type: Not specified

Information Source: <http://www.safetytechint.com>

Responder Knowledge Database

Status: The vendor has not responded

NFPA Certification: Not specified

OSHA EPA Level: Level C with appropriate full facepiece negative pressure or PAPR

Unit Cost: Contact distributors or manufacturers

Independent Testing: Manufactured according to Israel Defense Forces (IDF) criteria and has passed the same tests and quality control that IDF uses. Samples of this equipment have been tested and proven to be impermeable by mustard gas for a period of 6 h.

Material Technology: Suits are manufactured from high tensile strength, multi-layer co-extruded plastic films which exhibit excellent mechanical and barrier properties. Edges are heat-sealed by a proprietary high-frequency welding process which produces continuous impermeable seams for protection against all known CWAs and toxic gases.

Design/Configuration: Not specified

Ensemble Design and Description: The Safety Tech International NBC Protective Suit is the same ensemble as worn by the Israel Defense Forces (IDF). This suit will meet the requirements of Level C protection when used with an appropriate full facepiece negative pressure or powered air-purifying respirator.

1. A two-piece protective suit consisting of pants and a shirt made of a multi-layered plastic. The shirt has an integral contoured hood with a cutout that can be easily fitted over any type of full face gas mask.
2. The reusable gloves are made from butyl rubber and come with a cotton liner. The gloves are impermeable to gaseous, liquid, and solid toxic substances.
3. The reusable shoe covers, molded from a special thermoplastic elastomer, are soft, flexible, and impermeable.

CAs Protected Against: Impermeable by mustard gas for a period of 6 h

BAs Protected Against: Not specified

TIMs Protected Against: Not specified

APPENDIX F—PROTECTIVE FOOTWEAR DATA FIELDS

APPENDIX F—PROTECTIVE FOOTWEAR DATA FIELDS

Thirty-five fields were used to provide information relating to protective footwear. The 35 data fields are comprised of data fields from the market survey vendor questionnaire requesting information about their protective footwear. Because of the database limitations, several data fields on the vendor questionnaire were combined, but all the vendor-supplied information was entered into the database. All data fields were developed using input from the emergency responder community.

The data sheets are grouped according to the following five parameters and the number of data fields in each parameter:

- General (16 data fields).
- Capabilities (5 data fields).
- Human Factors (4 data fields).
- Design/Configuration (3 data fields).
- Logistics (7 data fields).

1.0 General

1.1 Product Information

Product information, including name, model, and/or stock number, is used to identify the protective footwear. The stock and/or model number indicates the number(s) that are used to uniquely identify the item. It should include the stock identification or national stock number, if the item has one.

1.2 Manufacturer Information

This data field identifies the company that manufactured the protective footwear (to include the name, address, telephone and FAX number, point of contact, email address, and manufacturer website).

1.3 Source

Source indicates where the protective footwear information was obtained. Potential sources include past market surveys, internet websites, conferences, or commerce business daily announcements.

1.4 Information Last Updated

This data field indicates when the information was last updated by the vendor.

1.5 NFPA Certification Status

This data field indicates if the product has been certified to NFPA standards, such as NFPA 1994 (2001 Edition) and includes the certification organization, the certification number, and the certification date. It also indicates the prognosis for future certification. Classifications for stand-alone protective footwear may include NFPA 1991 (2005 edition) or NFPA 1992 (2005 edition).

1.6 Certification with Ensemble

This data field identifies the ensembles (with vendor and model number) with which the footwear is certified, sold, or recommended for use.

1.7 Other Certifications

Other certifications that the footwear may have received (i.e., ANSI Z41 or mil-standards, or NFPA other than 1994, etc.) are included in this data field.

1.8 Independent Testing Information

This data field includes any test data obtained from sources regarding any part of the equipment (e.g., validation testing including materials and ensemble testing such as abrasion, tear, wear, burst, and permeation testing). Human factors testing results should be included as well (either quantitative or qualitative).

1.9 Technology

This data field identifies the material or process by which the protective footwear provides protection against CBRN and/or TICs/TIMs. Traditional hazardous materials response boots are constructed from nonpermeable barrier films, membranes or rubber materials. Military chemical protective boots couple inner adsorptive carbon layers with liquid resistant outer shell textiles. New technologies such as selectively permeable and semi-permeable membranes have been developed and field evaluated.

1.10 Protective Footwear Description

This data field provides an overall description of the protective footwear. Descriptions should include specifics on closures, tread, etc.

1.11 Protective Footwear Application

This data field identifies the areas where the protective footwear is most likely to be used per vendor or manufacturer recommendation (e.g., tactical operations, crisis management, etc.), or those areas where the protective footwear should not be used (i.e., in a flammable environment, etc.).

1.12 Flame-Resistant Material

This data field includes if the protective footwear is made using flame-resistant material (as demonstrated by meeting NFPA 1991 material flame-resistance requirements or by testing to ASTM D 6413 or ASTM F 1358).

1.13 EOD Compatibility

This data field identifies the ability of the protective footwear to be used with an EOD (protective bomb suit) protective system.

1.14 Unit Cost [Manufacturer's Suggested Retail Price (MSRP)]

This data field provides the estimated cost of a complete protective footwear system.

1.15 Availability

Availability indicates the lead time for acquiring initial quantities of protective footwear after the order has been placed. The data field also includes whether the footwear is in stock or if it is manufactured on demand.

1.16 References/User(s) of Product

*This data field identifies organizations (i.e., military use, commercial applications, civil-service instrument, etc.) that are currently using the piece of equipment. This information may include the average number of units each client has in operation and the average number of years these units have been in use. **References must be verified with consent from the users before including the contact information.***

2.0 Capabilities

2.1 Chemical Agents Protected Against

This data field indicates the type and state (i.e., liquid, vapor, or aerosol) of CAs the protective footwear protects against. The most common types of classic CAs are the nerve and blister agents. Nerve agents include GA (tabun), GB (sarin), GD (soman), GF, and VX. Blister agents include H and HD (sulfur mustards), HN (nitrogen mustard), and L (lewisite). This field should include details on the types of testing and the results related to manufacturer testing.

2.2 Biological Agents Protected Against

This data field indicates the type and state (i.e., liquid, vapor, or aerosol) of BAs the protective footwear protects against. Classical BA types include bacteria (anthrax), rickettsia (typhus), toxins (botulinum toxin), and viral (smallpox). This field should include details on the types of testing and the results related to manufacturer testing.

2.3 Toxic Industrial Chemicals/Material Protected Against

This data field indicates the type and state (i.e., liquid, vapor, or aerosol) of TIC/TIM the protective footwear protects against. TICs/TIMs are used in a variety of settings such as manufacturing facilities, maintenance areas, and storage areas.

2.4 Duration of Protection

This data field indicates the amount of time the protective footwear provides adequate protection. Since duration varies depending on the concentration of agent, type of agent, and environmental conditions, duration will be given with respect to specific conditions. NFPA 1994 requires 60 min (it is important to note that most missions are around 90 min) of protection; however, many protective footwear exceed this requirement so it is reasonable to assume that protective footwear can offer 2 h, 3 h, or 4 h of protection.

2.5 Physical Resistance and Durability

This data field addresses the physical strength of the protective footwear by describing its tear, puncture, and abrasion resistance. This data field also includes the resistance of the footwear to degradation from petroleum, oils, and lubricants (POLs). The user community indicated that durability is the foundation to the protective footwear being able to perform in the identified scenarios.

The upper cut resistance, upper puncture resistance, sole and heel abrasion resistance, sole and heel puncture resistance, and toe impact and compression resistance are based on the durability performance measures. NFPA 1994 Paragraphs: 7.1.4.2–5 & 7, 7.2.4.3–5, and 7.3.3.4–6)¹ should be provided.

3.0 Human Factors

3.1 Boot Weight

This data field provides the weight of an average configuration of the protective footwear (size large) in pounds.

3.2 Comfort

ASTM F 1154 Standard Practice for Qualitatively Evaluating the Comfort, Fit, Function, and Integrity of Chemical-Protective Suit Ensembles is a complex process based on wearer feedback. The comfort data field addresses the suitability of the protective footwear in the work environment on the basis of comfort, fit, form, function, and integrity.

¹ <http://www.tnema.org/Library/Misc/1994.pdf>

3.3 Traction/Slip Resistance

This data field includes both the safety aspects of the protective footwear, i.e., slip resistance on wet surfaces, as well as the ease of cleaning the sole of the footwear. A sole that has very deep grooves and offers good traction may be harder to clean. A sole with “slip resistant” sole may be easy to clean but may not offer adequate traction. Traction/skid resistance is based on the traction performance measures (NFPA 1994 Paragraphs: 7.1.4.6, 7.2.4.6, & 7.3.4.7) and the slip resistance test (ASTM F 489).

3.4 Don/Doff Information

This data field refers to the ease of putting on or taking off the protective footwear. Some footwear can be easily slipped on and off without using hands, and other footwear has built in mechanisms to aid in donning/doffing (i.e., heel tabs or pull on loops). Don/doff information also indicates whether the system requires assistance for donning and/or doffing and the average time for this activity.

4.0 Design/Configuration

4.1 Boot Height

NFPA 1994 (paragraph 6.4.2) requires that protective footwear must not be less than 8 in high when measured from the plane of the sole bottom. Some protective footwear comes higher than 8 in but has cut-off bands to make it easy to adjust the height.

4.2 Compatibility as an Overboot

This data field indicates if the protective footwear is large enough to be worn as an overboot or if the boot is sold as an overboot.

4.3 Protective Footwear Closures

This data field indicates if the protective footwear is supplied with closures, and if so, the type of closures with which the footwear is equipped. Information includes how well the footwear provides ankle support, as well as tightness of the fit and ease of operation of the closures.

5.0 Logistics

5.1 Technical Data Package

A technical data package (TDP) provides instruction with respect to maintenance and shelf life, the relevant factors to be considered are maintenance requirements, in-service performance and inspection procedures, environmental storage conditions, and estimated shelf life.

5.2 Package Shelf Life

This data field provides the length of time an unopened package of protective footwear can be reasonably stored under normal storage conditions without compromising the effectiveness of the protective footwear. Shelf life for sealed packages under normal storage conditions can typically be 5 yr, 10 yr, or as long as 15 yr. In some cases protective footwear is stored in extraordinary storage conditions, which could shorten the shelf life.

5.3 Storage Conditions

The recommended storage procedures and environment include any factors that decrease shelf life (e.g., UV, critical temperature). This data field also includes specific test data if available.

5.4 Sizes Available

This data field includes the number and variety of sizes available to the first responder community. There should be enough sizes to adequately fit most of the members of the response team, both male and female. The NFPA 1994 Standard requires protective footwear sizes ranging from a man's size 6 to size 15. However, a man's size 5 is comparable to a woman's size 7, so the NFPA standard does not include adequate shoe sizes for women.

5.5 Health Hazards and Safety

This data field identifies all materials associated with the protective footwear that possess a potential health hazard (especially latex or other allergens).

5.6 Material Safety Data Sheet

A material safety data sheet (MSDS) is required if any of the materials used to manufacture the equipment possess a potential health hazard.

5.7 Warranty

Warranty is the length of time the protective footwear is guaranteed by the manufacturer, including the terms of the warranty (parts and labor). This data field also includes specific details on what is covered in the warranty, along with the effective lifetime of the warranty, any restrictions in place by the manufacturer, the specific parts and labor that are covered, and the expected useful lifetime of the equipment.

APPENDIX G—PROTECTIVE FOOTWEAR INDEX AND DATA SHEETS

APPENDIX G—PROTECTIVE FOOTWEAR INDEX AND DATA SHEETS

ID#	Item	Model	Manufacturer	Page G-#
1	Toxicological Agent Protective Boot	TAP (8430-00-820-6301)	AirBoss Engineering Products, Inc.	G-1
2	AirBoss Lightweight Multipurpose Safety Boot	ALMSB (Obsolete)	AirBoss Engineering Products, Inc.	G-3
3	Lion Warhorse I and Warhorse II Rubber Boot	Warhorse I and Warhorse II	Lion Apparel	G-5
4	North Hazmat Knee Boot	75177	North Safety Products	G-7
5	Hazmax Kneeboot	87012	Onguard Industries	G-9
6	Hazmax EZ-Fit Boot	87015 (Green), 87007 (Black)	Onguard Industries	G-11
7	Technical Rescue/EMS Boot	6000	Pro Warrington	G-13
8	HazProof Overboot	82330 (Orange), 82331 (Black)	Tingley Rubber Corporation	G-15
9	Thorogood Neoprene Rubber Structural and Haz-Mat Fire Boot	807-6004	Weinbrenner Shoe Company	G-17
10	AirBoss Lightweight Overboot	ALO (NSN 8430-99-869-0394 to 0399; 8430-99-869-0538 to 0543)	AirBoss Engineering Products, Inc.	G-19
11	North SF Chem Overboot	11095	North Safety Products	G-21
12	Servus Black Vinyl Overshoe	Military BVO (C43995)	North Safety Products	G-23
13	Strapper Overboot	87050	Onguard Industries	G-25
14	Chemical Overshoe	87025	Onguard Industries	G-27
15	Paul Boyé Overboots	SURBOEXP	Paul Boyé	G-29
16	Lanx Chemical Protective Boot Liner	CPU-BL	Lanx Fabric Systems	G-31
17	AirBoss-Defense CBRN Fire Boot “The BOSS”	4098	AirBoss Engineering Products, Inc.	G-33

GENERAL

Toxicological Agent Protective Boot**Model:** TAP (8430-00-820-6301)

AirBoss Engineering Products, Inc.
881 Landry
Acton Vale, Quebec
J0H 1A0
Genevieve Lecours
450-546-2776 [ext. 337 (Tel)]
450-546-3735 (Fax)
Genevieve.lecours@airboss-acton.com

<http://www.airboss-acton.com>
Responder Knowledge Database (RKB)

Updated: January 13, 2006**Unit Cost:** The TAP Boot is \$85 depending on quantity and packaging**OSHA EPA Level:** Class 1/Level A**Certification Status:** Not certified**Certification Organization:** Not specified**Certification #:** Not applicable**Date Certified/Expected:** Not specified**Availability:** Manufactured on demand**Other Certifications:** Not specified**Independent Testing:** Not specified**Test Conducted:** Not specified**Test Dates:** Not specified**Material Technology:** The TAP Boot is made of extruded butyl rubber. It also has a steel toe for compression resistance.**Boot Description:** The TAP Boot is a hand-assembled NBC protective boot to protect against CW agents. It is also leak proof and corrosion resistant.**Boot Application:** The TAP Boot is designed for NBC protection. Can be submersed in water or any other type of liquid(s), radiation, and biological hazards.**Flame Resistance:** Not applicable**EOD Capability:** Not specified**References:** Canadian Commercial Corporation for DSCP—16 000 in use for 4 yr; CCC—Danie Stevens (819-956-3814); DSCP—Scott Reifsnnyder (215-737-5615); and DSCP—Tom Darcy

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 1 CA permeation resistance (100 g/m²). Based on reports from other products using the same butyl layer and offering more than 24 h protection (TOP 8-2-501), the TAP Boot will offer more than 60 min against the NFPA 1994 Class 1 CA challenge and NFPA 1991.**BAs Protected Against:** Exceeds NFPA 1994 liquid penetration protection and liquid biological threat protection. Based on reports we have from other products using the same butyl layer and offering more than 24 h protection to aerosol particles, the TAP Boot will offer more than 60 min against the NFPA 1994 liquid permeation requirements.**TIMs Protected Against:** Provides permeation resistance for some chemicals (but not for one of the complete batteries listed above). Based on reports we have on products using similar butyl rubber, we know that the TAP Boot will offer 60 min of protection to all NFPA 1994, Class 3, and including some of the NFPA 1991 TICs listed.**Duration of Protection:** The TAP Boot is designed to offer more than 24 h protection to chemical warfare agents and at least 1 h against TICs listed in NFPA 1994

Acetone cyanohydrin—>480 min before penetration—EN 374

Ammonia—7664-41-7—>480 min before penetration—EN 374

Arsine—7784-42-1—>480 min before penetration—Based on butyl layer

Chlorine—7782-50-5—No breakthrough after 480 min—ASTM F739

Fluorine—7782-41-4—>240 min before penetration—Based on the butyl/chloroprene compound

Formaldehyde (37 %)—50-00-0—>480 min before penetration—Based on butyl layer

Hydrogen bromide—10035-10-6—>480 min before penetration—Based on butyl layer

Hydrogen chloride—7647-01-0—>480 min before penetration—Based on butyl layer

Hydrogen cyanide—74-90-8—>480 min before penetration—Based on butyl layer

Fluorine—7782-41-4—>240 min before penetration—Based on the butyl/chloroprene compound
Formaldehyde (37%)—50-00-0—>480 min before penetration—Based on butyl layer
Hydrogen bromide—10035-10-6—>480 min before penetration—Based on butyl layer
Hydrogen chloride—7647-01-0—>480 min before penetration—Based on butyl layer
Hydrogen cyanide—74-90-8—>480 min before penetration—Based on butyl layer
Hydrogen sulfide—7783-06-4—>480 min before penetration—Based on butyl layer
Nitric acid, fuming—7697-37-2—>60 min—Based on butyl layer
Sulfur dioxide—7449-09-05—>120 min—Based on butyl layer
Sulfuric acid, concentrated—7664-93-9—96 %—No breakthrough after 480 min—ASTM F739

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** Blade distance >50.45 mm (1.99 in). Result based on other NFPA 1971 certified products (requiring the same cut resistance property) manufactured by AirBoss Defense. The TAP Boot should meet the NFPA 1991 Class 1 requirement.
- **Upper Puncture Resistance (ASTM F 1342):** 77.89 N (17.51 lbf) based on other NFPA 1971 certified products (requiring puncture resistance under a force of 58.72 N (13.2 lb)) manufactured by AirBoss Defense. The TAP Boot should meet the NFPA 1991 Class 1 requirement.
- **Sole/Heel Abrasion (ASTM D 1630):** Abrasive index—121 based on other NFPA 1971 certified products (using the same outsole and heel design and material) manufactured by AirBoss Defense. The TAP Boot is meeting the NFPA 1991 and NFPA 1994.
- **Sole/Heel Puncture Resistance (ANZI Z41):** Not specified
- **Toe Impact/Compression Resistance (ASTM Z41):** Impact clearance—1.94 cm (0.763 in) after an impact of 101.7 J (75 ft•lbf) (minimum requirement of 0.5 in)
 - Compression force—2791 [minimum requirement of 11121 N (25000 lbf)]
 - Results based on other NFPA 1971 certified products (using the same steel toe cap) manufactured by AirBoss Defense
 - The TAP is meeting the NFPA 1991 and NFPA 1994 requirement for compression resistance
- **Resistance (Other):** The upper material is cut, puncture, and abrasion resistant

HUMAN FACTORS

Boot Weight/Size: 2.54 kg (5.6 lb) for size 9

Comfort (ASTM F 1154): No ASTM F 1154 qualitative evaluation

Traction/Skid Resistance (ASTM F 489): Static Coefficient of Friction of 1 is based on other NFPA 1971 certified products (using the same outsole, heel material, and design) manufactured by AirBoss Defense. The TAP Boot is meeting the NFPA 1991 and NFPA 1994 requirement for slip resistance.

Tread: Not specified

Don/Doff Information: Assistance not needed for donning and/or doffing. Can easily slip on and off without using hands. Heel tab is available to aid in doffing. The TAP Boot can easily be donned and doffed in <30 s.

DESIGN/CONFIGURATION

Boot Height: The TAP Boot is 43 cm (17 in) high. Boot does not have cut-off bands.

Overboot Capability: Boot is limited to only wearing socks inside the boot

Boot Closure: Closures not available

LOGISTICS

TDP (Technical Data Package): Technical Data Package not available

Shelf Life: The TAP Boot will have a shelf life of 5 yr to 10 yr with the appropriate packaging (vacuum-sealed package).

Storage Conditions: -32 °C to 52 °C (-25 °F to 125 °F); from 30 % to 80 % rh. Do not store in direct sunlight.

Maintenance Required: Not specified

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. Half sizes and widths are not available.

Size Range: The TAP Boot will accommodate sizing from 5 through 17

Health Hazards and Safety:

- **Latex/Allergens:** No latex or other allergens
- **MSDS:** MSDS code: Boot AFS

Warranty: The TAP Boot is guaranteed for 12 mo against material and manufacturing defects from date of delivery

GENERAL

AirBoss Lightweight Multipurpose Safety Boot

Model: ALMSB

AirBoss Engineering Products, Inc.
881 Landry
Acton Vale, Quebec
J0H 1A0
Genevieve Lecours
450-546-2776 [ext. 337 (Tel)]
450-546-3735 (Fax)
Genevieve.lecours@airboss-acton.com

http://www.airboss-acton.com
Responder Knowledge Database (RKB)

Updated: October 19, 2006

Unit Cost: ~\$85 depending on quantity and packaging



OSHA EPA Level: Class 1/Level A

Availability: **Obsolete**—Replaced by AirBoss-Defense CBRN Fire Boot “The BOSS”

Certification Status: Other

Certification Organization: ALMSB is certified as BS EN 345-2:1996 Safety for Professional use in accordance with Article 10 of the Personal Protective Equipment Directive (89/686/EEC)

Certification #: Not applicable

Date Certified/Expected: Not specified

Independent Testing: Not specified

Test Conducted: Not specified

Other Certifications: Certified BS EN 345-2:1996 by Satra Safety Product Centre in February 2000

Material Technology: Made of one layer of butyl rubber on the inside and a chloroprene layer on the outside. Both layers are laminated together to make a single barrier. This barrier has unique properties for resistance to chemical warfare agents and also to POL and TICs. The ALMSB has a steel toe and steel plate for compression and puncture resistance.

Boot Description: Hand-assembled multipurpose protective boot to protect against CAs, POL, TICs, flame, compression, and puncture. It is also antistatic, leak proof and corrosion resistant. In combination with the removable liner, it offers heat and cold protection.

Boot Application: Flammable or flash fire environment, submersion in water or any other type of liquid(s), explosive atmospheres, radiation, and biological hazards

Flame Resistance: Flame resistant, but no afterflame and no afterglow as per EN 344-2 Clause 5.2.3/ISO 6940:1984; tested by Satra Safety Product Centre

EOD Capability: Antistatic and made with steel toe and steel plate; tested by Satra Safety Product Centre

References: Swedish Rescue Service (Räddning Verket)—20 000 in use for 8 yr

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 1 CA permeation resistance (100 g/m^2). Based on reports from other products using the same butyl layer and offering more than 24 h protection (TOP 8-2-501), the ALMSB will offer more than 60 min against the NFPA 1994 Class 1 CA challenge.

BAs Protected Against: Exceeds NFPA 1994 liquid penetration protection and liquid biological threat protection. Based on reports we have from other products using the same butyl layer and offering more than 24 h protection to aerosol particle, we know that the ALMSB will offer more than 60 min against the NFPA 1994 liquid permeation requirements.

TIMs Protected Against: Provides permeation resistance for some chemicals (but not for one of the complete batteries listed above). Based on reports we have on products using similar butyl rubber and also based on chloroprene properties, we know that the ALMSB will offer 60 min of protection to all NFPA 1994, Class 3, and including most of the NFPA 1991 TICs listed.

Duration of Protection: Designed to offer more than 4 h protection to chemical warfare agents, to POL and TICs listed in NFPA 1994

Acetone cyanohydrin—>480 min before penetration—EN 374

Ammonia—7664-41-7—>480 min before penetration—EN 374

Arsine—7784-42-1—>480 min before penetration—Based on butyl layer

Chlorine—7782-50-5—No breakthrough after 480 min—ASTM F739

Fluorine—7782-41-4—>240 min before penetration—Based on the butyl/chloroprene compound

Formaldehyde (37 %)—50-00-0—>480 min before penetration—Based on butyl layer

Hydrogen bromide—10035-10-6—>480 min before penetration—Based on butyl layer

Hydrogen chloride—7647-01-0—>480 min before penetration—Based on butyl layer
Hydrogen cyanide—74-90-8—>480 min before penetration—Based on butyl layer
Fluorine—7782-41-4—>240 min before penetration—Based on the butyl/chloroprene compound
Formaldehyde (37%)—50-00-0—>480 min before penetration—Based on butyl layer
Hydrogen bromide—10035-10-6—>480 min before penetration—Based on butyl layer
Hydrogen chloride—7647-01-0—>480 min before penetration—Based on butyl layer
Hydrogen cyanide—74-90-8—>480 min before penetration—Based on butyl layer
Hydrogen sulfide—7783-06-4—>480 min before penetration—Based on butyl layer
Nitric acid, fuming—7697-37-2—>60 min—Based on butyl layer
Sulfur dioxide—7449-09-05—>120 min—Based on butyl layer
Sulfuric acid, concentrated—7664-93-9—96 %—No breakthrough after 480 min—ASTM F739

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** Blade distance >50.45 mm (1.99 in). Result used on other NFPA 1971 certified products (requiring the same cut resistance property) manufactured by AirBoss Defense. The ALMSB is meeting the NFPA 1991 Class 1 requirement.
- **Upper Puncture Resistance (ASTM F 1342):** 77.89 N (17.51 lbf) based on other NFPA 1971 certified products (requiring puncture resistance under a force of 58.72 N (13.2 lb)) manufactured by AirBoss Defense. The ALMSB is meeting the NFPA 1991 Class 1 requirement.
- **Sole/Heel Abrasion (ASTM D 1630):** Abrasive index—121 based on other NFPA 1971 certified products (using the same outsole and heel design and material) manufactured by AirBoss Defense. The ALMSB is meeting the NFPA 1991 and NFPA 1994.
- **Sole/Heel Puncture Resistance (ANZI Z41):** 294.1 lbf (1.31 kN) based on other NFPA 1971 certified products (using the same steel toe cap and steel plate) manufactured by AirBoss Defense. The ALMSB is meeting the NFPA 1991 and NFPA 1994 requirement for puncture resistance of 1.21 kN (272 lbf).
- **Toe Impact/Compression Resistance (ASTM Z41):** Impact clearance—1.94 cm (0.763 in) after an impact of 101.7 J (75 ft•lbf) (minimum requirement of 0.5 in)
 - Compression force—2791 [minimum requirement of 11121 N (2500 lbf)]
 - Results based on other NFPA 1971 certified products (using the same steel toe cap and steel plate) manufactured by AirBoss Defense. The ALMSB is meeting the NFPA 1991 and NFPA 1994 requirement for compression resistance.
- **Resistance (Other):** The upper material is cut, puncture, and abrasion resistant; the upper and sole material does not degrade when exposed to petroleum, oil, and lubricants. The upper and sole material is antistatic. Boot has an impact-resistant toe cap and puncture-resistant midsole.

HUMAN FACTORS

Boot Weight/Size: 2.27 kg (5 lb) for size 9

Comfort (ASTM F 1154): No ASTM F 1154 qualitative evaluation

Traction/Skid Resistance (ASTM F 489): Static Coefficient of Friction of 1 is based on other NFPA 1971 certified products (using the same outsole, heel material, and design) manufactured by AirBoss Defense. The ALMSB is meeting the NFPA 1991 and NFPA 1994 requirement for slip resistance.

Don/Doff Information: Assistance not needed for donning and/or doffing. Can easily slip on and off without using hands. Boot offers a built-in mechanism to aid in donning and a heel tab is available to aid in doffing. The ALMSB can easily be donned and doffed in <30 s.

DESIGN/CONFIGURATION

Boot Height: The ALMSB is 33 cm (13 in) high. Boot does not have cut-off bands.

Overboot Capability: Limited to only wearing socks inside the boot

Boot Closure: Closures not available

LOGISTICS

TDP (Technical Data Package): Technical Data Package not available

Shelf Life: The ALMSB will have a shelf life of 5 yr with the appropriate packaging (vacuum sealed package)

Storage Conditions: -32 °C to 52 °C (-25 °F to 125 °F); from 30 % to 80 % rh. Do not store in direct sunlight.

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. Half sizes and widths are not available.

Size Range: The ALMSB will accommodate from 4 to 12 (38 to 46 French Points)

Health Hazards and Safety: No latex or other allergens. MSDS is not available.

Warranty: The ALMSB is guaranteed against material and manufacturing defects for 12 mo from date of delivery

GENERAL

Lion Warhorse I and Warhorse II Rubber Boot**Model:** Warhorse I and Warhorse II

Lion Apparel
6450 Poe Ave
Dayton, Ohio 45414
Tom Martin
tomm@lionapparel.com
877-410-6614 (Tel)
877-803-1032 (Fax)

<http://www.lionrescuewear.bx>
Responder Knowledge Database (RKB)

Updated: March 2005**Unit Cost:** Not specified**OSHA EPA Level:** Class 1/Level B**Certification Status:** NFPA 1992, 2005 Edition; NFPA 1971 (2001 Ed) Structural Fire Fighter Footwear**Certification Organization:** UL**Certification #:** SA8063 (NFPA 1971)**Date Certified/Expected:** Not specified**Other Certifications:** Not specified**Independent Testing:** Not specified**Test Conducted:** Not specified**Test Dates:** Not specified

Material Technology: NFPA 1971 Compliant Structural Fire Fighter Footwear is made with two primary layers: a rubber outer layer and an inner lining. The inner lining is secure inside the boot, and designed not to come out of the boot while doffing. The outer layer consists of natural rubber that provides initial limited protection against, heat, flame, liquid, abrasions, and punctures. The inner liner adds additional limited protection from heat. Several different types of lining are available and may contain more than one component. Lining may consist of wool felt lining for moisture absorption and limited insulation. Lining may consist of Kevlar/Nomex for additional limited cut protection. Lining may also contain an expanded rubber layer for limited insulation from heat and cold.

Boot Description: NFPA 1971 footwear provides a limited barrier against penetration from sharp objects and liquids contacted on the fire grounds. Because it is made of special heat and flame-resistant materials, rubber uppers and rubber soles, it provides limited resistance to heat and flame for brief periods of time, without itself combusting and burning. The label is located on the inside of the lining and contains a statement indicating that the footwear was manufactured in compliance with the NFPA 1971 standard and containing information regarding the date of manufacture and the manufacturing information.

Boot Application: This Footwear is designed to provide limited protection under the requirements of the NFPA 1971 standard to the foot, ankle, and lower leg against hazards arising from structural fire fighting operations, and nonfire-related rescue operations, emergency medical operations, and victim extrication, including: heat and flame; liquid splash of 5 common fire ground chemicals, including AFFF Foam, battery acid, hydraulic fluid, gasoline, 65 % chlorine solution; penetration of blood and other body fluids; cold weather; physical hazards, including puncture, crushing, cuts, and abrasion; and rain and hose stream water. Do not use for protection against hazardous radiological agents.

Flame Resistance: Do not use for direct contact with flames or molten metal. Do not use for proximity or entry fire fighting.

EOD Capability: Not specified

CAPABILITIES

CAs Protected Against: Do not use for protection against hazardous CAs

BAs Protected Against: Do not use for protection against hazardous BAs

TIMs Protected Against: Emergency response personnel can encounter many common liquids during normal performance of their duties. The reference to limited protection from liquid splash from five common fire ground chemicals should not be interpreted to mean that the footwear is suitable or is permitted to be used for protection to the wearer during any hazardous materials situation.

Duration of Protection: Not specified

Not specified

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):**

- **Tibia protector**—The footwear may incorporate a tibia protector of rubber padding and a corrugated cover to add limited protection to the tibia area.
- **Ankle bone protection patch**—The footwear may incorporate an ankle bone protection patch of rubber padding and corrugated cover. Padding may be yellow for increased visibility.
- **Foxing**—Bright yellow corrugated rubber surrounds the area above the sole for increased visibility.
- **Toe protection system**—The footwear has stainless steel toes and a rubber toe cap to provide limited protection from puncture, crushing, and abrasions.
- **Upper Puncture Resistance (ASTM F 1342)**: Not specified
- **Sole/Heel Abrasion (ASTM D 1630)**: Not specified
- **Sole/Heel Puncture Resistance (ANZI Z41)**: Not specified
- **Toe Impact/Compression Resistance (ASTM Z41)**: Not specified
- **Resistance (Other)**: Not specified

HUMAN FACTORS

Boot Weight/Size: Not specified

Comfort (ASTM F 1154): Removable Insole: The shock absorbing insole can be removed to help promote drying. It can also be replaced.

Traction/Skid Resistance (ASTM F 489): Not specified

Tread: The rubber sole of either lug or calendared design is resistant to oil, fuel, heat, and acid

Don/Doff Information: Pull-on boot straps: Provides a grasping mechanism to allow the user to more easily pull the footwear on. Before donning, check to make sure that the footwear, including the inner layer and inner sole, is thoroughly dry, and that the inner sole is placed in the bottom of the footwear. Use the pull-on straps and pull the footwear securely onto your foot. Check and adjust for comfortable, secure fit. Before entering a hazard area, you must have a partner inspect the area where the footwear interfaces with your trousers in order to assure proper overlap of all components of your NFPA 1971 Protective Ensemble, including trousers and footwear.

DESIGN/CONFIGURATION

Boot Height: Not specified

Overboot Capability: Not specified

Boot Closure: Not specified

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life: Not specified

Storage Conditions: Not specified

Maintenance Required: You should inspect your Footwear at the following times: 1) Upon receipt of your new Footwear or replacement component; 2) At least monthly thereafter during the useful life of the footwear; 3) After exposure to heat, flames, chemicals, or fire fighting agents (including AFFF foam and water); 4) After exposure to body fluids (including blood); and 5) after washing, repair or decontamination. You must inspect your footwear as a minimum, at the above frequency intervals to detect more obvious damage and deterioration. In addition, you might sense deficiencies in thermal protection by feeling heat more quickly or more easily than before, or get wet from rain or hose streams leaking through the materials or seams. Whenever you detect a potential problem through your own inspection, or suspect that the protective qualities might be degraded, your footwear should be inspected by a trained expert at the Fire Department or at a Lion Apparel Authorized Clean and Repair Center.

Sizes Available: Footwear should have adequate room for toes to lay flat in the boot, and there should not be too much movement in the heel area. Failure to ensure the proper fit of your NFPA 1971 Compliant Footwear could result in serious injury. Footwear that does not properly fit will have a shortened useful life. If the footwear does not seem to fit properly, you should check the size in the label to make sure it is your size, and to make sure it is your footwear.

Size Range: Not specified

Health Hazards and Safety:

- **Latex/Allergens:** Not specified
- **MSDS:** Not specified

Warranty: Not specified

GENERAL

North Hazmat Knee Boot

Model: 75177

North Safety Products
 2000 Plainfield Pike
 Cranston, Rhode Island 02921
 Lynn Aurelius
 800-603-1645 ext 4015 (Tel)
 309-403-3549 (Fax)
 PM/Director-DPGroup
 lynn.aurelius@northsafety.com

<http://www.northsafety.com>
 Responder Knowledge Database (RKB)

Updated: March 15, 2006

Unit Cost: Not specified



OSHA EPA Level: Class 1/Level A

Certification Status: NFPA 1992

Certification Organization: SEI—ANSI Z41—1999, Personal Protection, Protective Footwear User Guide

Certification #: Not specified

Date Certified/Expected: Not applicable

Availability: In stock

Other Certifications: Although not certified to NFPA standards, by virtue of its construction North Hazmat Boots are compliant with ASTM F2413-05 (ANSI Z4-1999) for personal protective footwear and are certified to CSA Z195 standard by 3rd party organization (CSA)

Independent Testing: Not applicable**Test Conducted:** Not applicable**Test Dates:** Not applicable

Material Technology: North Hazmat Boots stock No. 75177 are made of a specially formulated PVC compound to resist a variety of TICs

Boot Description: North Hazmat Boot Stock No. 75177 are injection-molded PVC over-the-foot footwear, especially molded on ankle fit last, to provide better ankle support to the wearer. These boots' soles are made with PVC compound soft enough to offer slip resistance while maintaining abrasion resistance for longer service life. Triple Density Technology (TDT) outsole design aids to slip resistance offered by special compounding.

Boot Application: North Hazmat boots with its specially formulated PVC compound will withstand exposure to CA like sarin and mustard. Can be submersed in water or any other type of liquid(s) and used for biological applications.

Flame Resistance: Not flame resistant**EOD Capability:** Not EOD compatible

CAPABILITIES

CAs Protected Against: Not specified**BAs Protected Against:** Not specified**TIMs Protected Against:** Not specified**Duration of Protection:** Not specified

Not specified

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** Yet to be tested
- **Upper Puncture Resistance (ASTM F 1342):** Yet to be tested
- **Sole/Heel Abrasion (ASTM D 1630):** Yet to be tested
- **Sole/Heel Puncture Resistance (ANZI Z41):** Boot is constructed with puncture-resistant steel midsole plate as an integral component of footwear. These sole plates are 3rd-party certified for compliance with ANSI Z41 (i.e., ASTM F2413-05) and CSA Z195 standards. Puncture resistance ≥ 1.21 kN (272 lbf).
- **Toe Impact/Compression Resistance (ASTM Z41):**

- Boot is constructed with impact and compression-resistant steel box toe caps as an integral component of footwear. This footwear with incorporated steel toes is 3rd-party certified for compliance with ANSI Z41 (i.e., ASTM F2413-05) and CSA Z195 standards.
- Typical clearance after 101.7 J (75 ft•lbf)
- Impact →1.27 cm (0.5 in)
- Typical compression force—11121 N (2500 lbf) minimum
- **Resistance (Other):** The upper and sole material does not degrade when exposed to petroleum, oil, and lubricants. Boot exceeds ANSI and CSA standards for dielectric footwear. Boot has an impact-resistant toe cap and puncture-resistant midsole.

HUMAN FACTORS

Boot Weight/Size: 2.51 kg (5.54 lb) for size 9

Comfort (ASTM F 1154): No ASTM F 1154 qualitative evaluation

Traction/Skid Resistance (ASTM F 489): Yet to be tested

Tread: Not specified

Don/Doff Information: Can easily slip on and off without using hands; donned and doffed in 0 s to 30 s

DESIGN/CONFIGURATION

Boot Height: 38 cm (15 in); boot does not have cut-off bands

Overboot Capability: Boot is limited to only wearing socks inside the boot

Boot Closure: Closures not available

LOGISTICS

TDP (Technical Data Package): Technical Data Package not available

Shelf Life: Shelf life of 5 yr for North Hazmat PVC boots is determined based on the fact that PVC under normal conditions will not degrade

Storage Conditions: Less than or equal to 38 °C (100 °F)

Maintenance Required: Since the chemical resistance or other protective properties of North Hazmat boots will tend to diminish with wear tear, it is recommended that user maintain this footwear by cleaning it after each exposure. Generally washing with soap and warm water is recommended. It is also suggested that user inspect his/her footwear prior to each use for any damage such as cracks to the footwear. Any evidence of damage should result in taking the footwear out of service.

Sizes Available: North Hazmat Boots are available in sizes 7 through 15. Half sizes and widths are not available.

Size Range: Sizes 7 through 15

Health Hazards and Safety:

- **Latex/Allergens:** No latex or other allergens
- **MSDS:** 29 CFR 1910.1200 does not require an MSDS for finished article such as footwear

Warranty: These boots are unconditionally guaranteed to be free from material or workmanship defects for 1 yr from date of purchase

GENERAL

Hazmax Kneeboot

Model: 87012

Onguard Industries
1850 Clark Road
Havre de Grace, Maryland 21078
William Alexander, Chemist
410-272-2000 [ext 109 (Tel)]
410-942-0814 (Fax)
walexander@onguardindustries.com

<http://www.onguardindustries.com>
Responder Knowledge Database (RKB)

Updated: January 9, 2006

Unit Cost: \$52



OSHA EPA Level: Class 1/Level A

Certification Status: NFPA 1991 (2005 Edition)

Certification Organization: SEI—NFPA 1991, 2005 Edition Base Requirements (Chemical and Biological Terrorism Protection)

Certification #: VPS-OIL-01

Date Certified/Expected: Not specified

Availability: In stock; minimum order required

Other Certifications: Certified to CSA-Z195-02 Standard for Safety Footwear Toe Impact Properties, Third-Party Test Compliance to ASTM F2413-05 Standard for Toe Impact/Compression Properties

Independent Testing: Intertek, Geomet, and Artech for NFPA Certification by SEI Certifying Organization August 24, 2005; Artech for ASTM F2413-05, and CSA for CSA Z195-02

Test Conducted: NFPA permeation and physical performance requirements for footwear elements, ASTM F2413-05 Toe Impact/Compression Data and Electric Shock Resistant Data

Test Dates: August 24, 2005 for SEI Certification Testing to NFPA 1991; April 2005 for ASTM F2413, 2005 for CSA

Material Technology: This boot is constructed of Onguard's high viscosity, proprietary blend, formulated to resist permeation to hazardous chemicals

Boot Description: The boot meets the requirements of the NFPA 1991 Standard on vapor protective ensembles for Hazardous materials, 2005 Edition, including requirements for CAs. This style also meets and exceeds the CSA standards for Electric Shock Resistant Footwear.

Boot Application: Submersion in water or any other type of liquid(s), biological hazards, and liquefied gas conditions

Flame Resistance: Compliance to NFPA 1991, using ASTM-F1358 test method

EOD Capability: Not EOD compatible

CAPABILITIES

CAs Protected Against: NFPA 1994, 2001 Edition Class 1 and NFPA 1991, 2005 Edition. NFPA 1991, 2005 Edition with chemical/bio permeation resistance to cyanogen chloride (CK), dimethyl sulfate, sarin (GB), carbonyl chloride (CG), hydrogen cyanide (HCN), and sulfur mustard (HD).

BAs Protected Against: Exceeds NFPA 1994 by providing "systems level" aerosol threat protection

TIMs Protected Against: Meets NFPA 1994 Class 1 liquid/gases permeation requirements

Duration of Protection: All tests were concluded after 3 h. Average of 3 cells.

Acrylonitrile—144 min—35 permeation—ASTM F 739

Ammonia—>180 min—<0.03 permeation—ASTM F 739

Carbon disulfide—162 min—5.8 permeation—ASTM F 739

Chlorine—>180 min—<0.01 permeation—ASTM F 739

Dimethylhydrazine—253 min—0.002 permeation—ASTM F 739

Ethylene oxide—>180 min—<0.01 permeation—ASTM F 739

Hydrogen chloride—>180 min—<0.01 permeation—ASTM F 739

Hydrogen fluoride—35 min—500 permeation—ASTM F 739
Nitric acid, fuming—>480 min—not applicable—ASTM F 739
Nitrogen dioxide—440 min—0.12 permeation—ASTM F 739
Sulfuric acid, concentrated—>180 min—<0.1 permeation—ASTM F 739

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** 51.5 mm (2.03 in), compliant to NFPA 1991, 2005 Edition
- **Upper Puncture Resistance (ASTM F 1342):** 52.0 N (11.7 lbf) compliant to NFPA 1991, 2005 Edition
- **Sole/Heel Abrasion (ASTM D 1630):** Sole—106; heel—106, compliant to NFPA 1991, 2005 Edition
- **Sole/Heel Puncture Resistance (ANZI Z41):** 1.62 kN (364 lbf), compliant to NFPA 1991, 2005 Edition
- **Toe Impact/Compression Resistance (ASTM Z41):**
 - Toe impact—1.52 cm to 1.55 cm (0.60 in to 0.61 in)
 - Compression—18682 N (4200 lbf), 19305 N (4340 lbf) compliant to NFPA 1991, 2005
- **Resistance (Other):** The upper material is cut, puncture, and abrasion resistant. Boot exceeds ANSI and CSA standards for dielectric footwear. Boot has an impact-resistant toe cap and puncture-resistant midsole. The upper material is cut, puncture, and abrasion resistant. Boot exceeds ASTM F2413-05 and CSA Z195-02 standards for impact-resistant toe cap and puncture resistant midsole.

HUMAN FACTORS

Boot Weight/Size: 2.95 kg (6.5 lb)

Comfort (ASTM F 1154): No ASTM F 1154 qualitative evaluation

Traction/Skid Resistance (ASTM F 489): Static Coefficient of Friction—0.93, 0.96, compliant to NFPA 1991, 2005 Edition

Tread: Ultragrip Sipe Outsole

Don/Doff Information: Can easily slip on and off without using hands; heel tab is available to aid in doffing; donned and doffed in >60 s

DESIGN/CONFIGURATION

Boot Height: 40.64 cm (16 in); boot has cut-off bands

Overboot Capability: Boot can easily fit over a Level A suit

Boot Closure: Closures not available

LOGISTICS

TDP (Technical Data Package): Technical Data Package not available

Shelf Life: Shelf life of over 15 yr. However, the shelf life is diminished under storage conditions such as high temperature and humidity, over exposure to sunlight, and vapors or cross contamination of other garments, storage containers or tools.

Storage Conditions: Do not store in sunlight. Store in a dry environment and avoid excessive heat and cold during storage. Store away from vapors from solvents, corrosives, or other chemical contaminants that might degrade the boot product. Do not fold the boot.

Maintenance Required: The integrity and safety of the boot product can be maintained through proper cleaning, storage, and inspection procedures. No replaceable components with the exception of cushioned insoles, which are not a part of the performance criteria.

Sizes Available: Sizes 6 to 15 available. Half sizes and widths are not available.

Size Range: Will accommodate sizing from boot sizes 6 to 15 available

Health Hazards and Safety:

- **Latex/Allergens:** No latex or other allergens
- **MSDS:** MSDS not available

Warranty: Reference the Onguard Industries product literature catalog for any warranty information

GENERAL

Hazmax EZ-Fit Boot**Model:** 87015 (Green), 87007 (Black)

Onguard Industries
 1850 Clark Road
 Havre de Grace, Maryland 21078
 William Alexander, Chemist
 410-272-2000 [ext 109 (Tel)]
 410-942-0814 (Fax)
 walexander@onguardindustries.com

<http://www.onguardindustries.com>
 Responder Knowledge Database (RKB)

Updated: January 9, 2006**Unit Cost:** \$52**OSHA EPA Level:** Class 1/Level A**Certification Status:** NFPA 1991 (2005 Edition)**Certification Organization:** SEI—NFPA 1991, 2005 Edition Base Requirements (Chemical and Biological Terrorism Protection)**Certification #:** VPS-OIL-01-Variant 03**Date Certified/Expected:** Not specified**Availability:** In stock—minimum order required**Other Certifications:** Certified to CSA-Z195-02 Standard for Safety Footwear Toe Impact Properties, Third-Party Test Compliance to ASTM F2413-05 Standard for Toe Impact/Compression Properties**Independent Testing:** Intertek, Geomet, and Artech for NFPA Certification by SEI Certifying Organization August 24, 2005; Artech for ASTM F2413-05, and CSA for CSA Z195-02**Test Conducted:** NFPA Permeation and Physical Performance Requirements for Footwear Elements (ASTM F2413-05 Toe Impact/Compression Data and Electric Shock Resistant Data)**Test Dates:** August 24, 2005 for SEI Certification Testing to NFPA 1991; April 2005 for ASTM F2413, 2005 for CSA**Material Technology:** This boot is constructed of Onguard's high viscosity, proprietary blend, formulated to resist permeation to hazardous chemicals**Boot Description:** The boot meets the requirements of the NFPA 1991 Standard on vapor protective ensembles for Hazardous materials, 2005 Edition, including requirements for CAs**Boot Application:** Submersion in water or any other type of liquid(s), biological hazards, and gas conditions**Flame Resistance:** Compliance to NFPA 1991, using ASTM-F1358 test method**EOD Capability:** Not EOD compatible

CAPABILITIES

CAs Protected Against: NFPA 1994, 2001 Edition Class 1 and NFPA 1991, 2005 Edition. NFPA 1991, 2005 Edition with chemical/bio permeation resistance to cyanogen chloride (CK), dimethyl sulfate, sarin (GB), carbonyl chloride (CG), hydrogen cyanide (HCN), and sulfur mustard (HD).**BAs Protected Against:** Exceeds NFPA 1994 by providing "systems level" aerosol threat protection**TIMs Protected Against:** Meets NFPA 1994 Class 1 liquid/gases permeation requirements**Duration of Protection:** All tests were concluded after 3 h. Average of 3 cells.

Acrylonitrile—144 min—35 permeation—ASTM F 739

Ammonia—>180 min—<0.03 permeation—ASTM F 739

Carbon disulfide—162 min—5.8 permeation—ASTM F 739

Chlorine—>180 min—<0.01 permeation—ASTM F 739

Dimethylhydrazine—253 min—0.002 permeation—ASTM F 739

Ethylene oxide—>180 min—<0.01 permeation—ASTM F 739

Hydrogen chloride—>180 min—<0.01 permeation—ASTM F 739

Hydrogen fluoride—35 min—500 permeation—ASTM F 739
Nitric acid, fuming—>480 min—not applicable—ASTM F 739
Nitrogen dioxide—440 min—0.12 permeation—ASTM F 739
Sulfuric acid, concentrated—>180 min—<0.1 permeation—ASTM F 739

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** 51.5 mm (2.03 in), compliant to NFPA 1991, 2005 Edition
- **Upper Puncture Resistance (ASTM F 1342):** 52.0 N (11.7 lbf) compliant to NFPA 1991, 2005 Edition
- **Sole/Heel Abrasion (ASTM D 1630):** Sole—106, heel—106, compliant to NFPA 1991, 2005 Edition
- **Sole/Heel Puncture Resistance (ANZI Z41):** 1.62 kN (364 lbf), compliant to NFPA 1991, 2005 Edition
- **Toe Impact/Compression Resistance (ASTM Z41):** Toe Impact—1.52 cm to 1.55 cm (0.60 in to 0.61 in); Compression—18682 N (4200 lbf), 19305 N (4340 lbf) compliant to NFPA 1991, 2005
- **Resistance (Other):** The upper material is cut, puncture, and abrasion resistant. Boot sole exceeds ASTM F2413-05 Standard for electric shock resistant footwear. Boot has an impact-resistant toe cap and puncture-resistant midsole. The sole material is cut, puncture, and abrasion resistant. Boot exceeds ASTM F2413-05 and CSA Z195-02 standards for impact-resistant toe cap and puncture-resistant midsole.

HUMAN FACTORS

Boot Weight/Size: 2.95 kg (6.5 lb)

Comfort (ASTM F 1154): No ASTM F 1154 qualitative evaluation

Traction/Skid Resistance (ASTM F 489): Static Coefficient of Friction—0.85, 0.87, compliant to NFPA 1991

Tread: EZ-Decon Outsole

Don/Doff Information: Can easily slip on and off without using hands; donned and doffed in >60 s

DESIGN/CONFIGURATION

Boot Height: 27.94 cm (11 in)

Overboot Capability: Boot can easily fit over a Level A suit

Boot Closure: Closures not available

LOGISTICS

TDP (Technical Data Package): Technical Data Package available

Shelf Life: Shelf life of over 15 yr. However, the shelf life is diminished under storage conditions such as high temperature and humidity, over exposure to sunlight, and vapors or cross contamination of other garments, storage containers or tools.

Storage Conditions: Do not store in sunlight. Store in a dry environment and avoid excessive heat and cold during storage. Store away from vapors from solvents, corrosives, or other chemical contaminants that might degrade the boot product. Do not fold the boot.

Maintenance Required: The integrity and safety of the boot product can be maintained through proper cleaning, storage, and inspection procedures. No replaceable components with the exception of cushioned insoles, which are not a part of the performance criteria.

Sizes Available: Small, medium, large, and X-large. Half sizes and widths are not available.

Size Range: Individual should order two sizes up from regular shoe size

Health Hazards and Safety:

- **Latex/Allergens:** No latex or other allergens
- **MSDS:** MSDS not available

Warranty: Reference the Ongaard Industries product literature catalog for any warranty information

GENERAL

Technical Rescue/EMS Boot

Model: 6000

Pro Warrington
 Valerie Bryan
 937-264-2662 x254 (Tel)
 U.S. Military
 Fisher Scientific (sole source dealer for the U.S. Military)
 Brian Blinn, Regional Director
 937-264-2662 x264 (Tel)
 Brian Dillon, Inside Marketing Associate
 937-264-2662 x260 (Tel)

Responder Knowledge Database (RKB)

Updated: March 2006

Unit Cost: \$250



OSHA EPA Level: Class 1/Level B

Certification Status: NFPA 1992 (2005 Edition); NFPA 1999 (2003 Edition)

Certification Organization: SEI

Certification #: Not specified

Date Certified/Expected: Not specified

Other Certifications: Wildland Boot—NFPA 1977, 1998 Edition (Optional)

Total Fire Group Model 6000 Leather/PBO Rip Stop (Quad-Certified)

NFPA 1951, 2001 Edition Urban Search and Rescue

NFPA 1999, 2003 Edition Emergency Medical Operations

NFPA 1977, 1998 Edition Wildland (Optional)

Independent Testing: Not specified

Test Conducted: Not specified

Test Dates: Not specified

Material Technology: Liner system—Cambrelle® lining laminated to full height CROSSTECH® Footwear Fabric. All seams butt stitched and sealed with GORE-TEX® tape.

Collar top—1 in comfort top collar lined with foam for extra comfort and chafe prevention.

Thread uppers—Nomex® 24/4 and 105 Kevlar®.

Upper stitching—100 % Singer lock stitch prevents stitches from unraveling.

Upper stitch configuration—Double needle stitching shall be used on vamp, counter pocket, backstays, and tip. Single-needle stitching shall be used on collar and eye rows.

Thread-welt to midsole— #690 Bonded Nomex®.

Thread-inseaming—Nomex® 24/4 and 105 Kevlar®.

Sole and heel blocker ADHESION—Nail-less construction, high-temperature adhesive shall be used to affix blocker to neoprene midsole.

Powertoe™ cover—Patented fire resistant, abrasion resistant rubber covering entire frontal toe area and incorporating three horizontally extended durability bumper cleats.

Upper—MIL AB 5.5 oz full grain silicone-impregnated leather and PBO (poly [p-phenylene-2,6-benzobisoxagole]) Rip Stop fabric for superb puncture resistance and flame retardancy.

Insole cavity filler—Ground cork compound.

Midsole—Full length 4 iron black neoprene rubber.

Welt—Full wrap-around Goodyear neoprene storm welt.

Insert—Patented DRYZ® polyurethane insert comprised of polymer agents capable of absorbing 160 times its weight in moisture. Fabric liner controls bacteria in foot area. By design insert is both removable and replaceable.

Backpart molded heel counter—0.50 thermoplastic backpart molded heel counter provides proper stabilization ensuring superior comfort, fit, durability, and extra support.

Boot Description: General—10 in high-speed lace, fabric/leather boot designed for Technical Rescue/USAR/EMS/Splash Protection. Fire-resistant fabric, water-repellent leather, safety toes, electrical hazard rated soles, bottom penetration resistant barrier, and steel shank. Safety boots shall meet or exceed NFPA 1951 “Standard on Protective Ensemble for USAR Operations” 2001 Edition, NFPA 1999 “Standard on Protective Clothing for Emergency Medical Operations” 2003 Edition,

NFPA 1992 “Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies” 2000 Edition, NFPA 1977 “Standard on Protection Clothing and Equipment for Wildland Fire Fighting” 1998 Edition (optional), plus highest protection level of ANSI Z.41.1 PT 99 FI & MI 75/C 75 EH, PR and OSHA 29CFR 1910.136. Boots also utilize ASTM F-1671 test method for viral penetration resistance.

Upper—MIL AB 5.5 oz. full grain silicone impregnated leather and PBO (poly [p-phenylene-2,6-benzobisoxagole]) Rip Stop fabric for superb puncture resistance and flame retardancy.

Boot Application: Hard-working quad-certified boot designed for Technical Rescue/USAR teams

Flame Resistance: Not specified

EOD Capability: Not specified

CAPABILITIES

CAs Protected Against: Not specified	BAs Protected Against: Not specified
TIMs Protected Against: Not specified	Duration of Protection: Not specified

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** Not specified
- **Upper Puncture Resistance (ASTM F 1342):** Not specified
- **Sole/Heel Abrasion (ASTM D 1630):** Not specified
- **Sole/Heel Puncture Resistance (ANZI Z41):**
 - Safety toe—Composite toe eliminates heat and cold conductivity. Exceeds ANSI Z41 requirements.
 - Shank—Austempered steel with triple linear ridges. Treated with zinc phosphate rust preventative.
 - Puncture resistant bottom plate—0.021 stainless flex steel sized to allow maximum bottom puncture resistance protection within insole channel.
 - Insole—4 iron Texon designed for welt construction boots. Resistant to fungal growth (Protex treated). Wicks perspiration away from the foot and dries quickly. Underside is lined with woven Kevlar® and 7 oz black Therm-a-Plus. Low weight with excellent flex endurance.
- **Toe Impact/Compression Resistance (ASTM Z41):** Not specified
- **Resistance (Other):** Not specified

HUMAN FACTORS

Boot Weight/Size: Not specified

Comfort (ASTM F 1154): Not specified

Traction/Skid Resistance (ASTM F 489): Not specified

Tread: Sole and heel blocker—Vibram® lug sole designed with lugs angled to provide substantial edging capabilities on both ascents and descents. Center medallion of stars surrounded by lug pattern provides maximum wear and traction. Larger lugs are close together for excellent durability yet separate for enhanced grip. Smaller lugs for more aggressive traction. Larger lugs on heel area to assure long lasting durability in this high-wear area. Lugs grouped for durability and grooved for traction. Soles are replaceable by construction.

Don/Doff Information: Not specified

DESIGN/CONFIGURATION

Boot Height: 25 cm (10 in) high speed lace

Overboot Capability: Not specified

Boot Closure: Laces—183 cm (72 in) rounded taslon

LOGISTICS

TDP (Technical Data Package): Not specified	Shelf Life: Not specified
Storage Conditions: Not specified	Maintenance Required: Not specified
Size Range: Not specified	Warranty: Not specified

Sizes Available: Stocked sizes (full and half sizes)—D (5 to 13); EE (5 to 13); EEE (5 to 13). Special make-up sizes available upon request.

Health Hazards and Safety:

- **Latex/Allergens:** Not specified
- **MSDS:** Not specified

GENERAL

HazProof Overboot

Model: 82330 (Orange), 82331 (Black)

Tingley Rubber Corporation
1 Cragwood Road, Suite 303
South Plainfield, New Jersey 07080
Robert Francolini
908-757-7474 (Tel)
908-757-9239 (Fax)
rfrancolini@tingleyrubber.com

<http://www.tingleyrubber.com>
Responder Knowledge Database (RKB)

Updated: January 10, 2006

Unit Cost: \$56



OSHA EPA Level: Class 1/Level A

Certification Status: NFPA 1991 (2005 Edition)

Certification Organization: SEI—NFPA 1991, 1992, and 1994

Certification #: VPS-TIN-01

Date Certified/Expected: December 22, 2005

Other Certifications: ISO 9001-2000

Independent Testing: ASTM, ANSI, CSA, MIL-STD

Availability: In stock

Test Conducted: ASTM F 739 Permeation Resistance; ASTM F 1001 21 Chemicals; MIL-STD-282; ASTM F 1358 Flame Resistant; ASTM F1342 Puncture Propagation Upper; ANSI Z41 PT99 EH Electrical Hazard; ANSI Z41 PT99 PR-M Puncture Resistance Sole & Heel; ASTM D1630 Abrasion Resistance Sole & Heel; ANSI Z41 PT99 M I/75 Toe Impact Resistance; ANSI Z41 PT99 M C/75 Toe Compression Resistance; ASTM F 489 Slip Resistance; ASTM F 1790 Cut Resistance Upper; and NFPA 1991, 2005 Ladder Shank Bending Resistance.

Test Dates: Not specified**Material Technology:** Fire-retardant PVC alloy impermeable per NFPA chemicals and CAs

Boot Description: Injection-molded seamless construction 100 % liquid proof. Oversized foot bed design to accommodate the bulk of an encapsulated suit. Full gusseted opening allows for easier donning and doffing and is secured with replaceable stretch fasteners. Steel toe, steel shank, steel mid-sole, and sure grip cleated outsole. Orange color.

Boot Application: Submersion in water or any other type of liquid(s) and biological hazards**Flame Resistance:** Yes—fire-retardant PVC alloy, per NFPA 1991, 2005 Edition**EOD Capability:** Not EOD compatible**References:** Baltimore City—250 units for 1 yr—Ed Arnold, Fire fighter

City of Chicago—600 units for 4 yr—Chief Daniel O'Collell

FBI Laboratories, Quantico, VA—500+ units for 3 yr—Fred Broccolo, Hazmat Officer

Greater Cincinnati Hazmat Unit—200 units for 1 yr—Bud Zorb

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991, 2005

MIL-STD 282, DOD Report Number ECBC-TR Permeation testing HD, GB.

MIL-STD-282 (HD, VX, GB, GD, and GA)

BAs Protected Against: Exceeds NFPA 1994 by providing “systems level” aerosol threat protection**TIMs Protected Against:** Meets NFPA 1994 Class 1 liquid/gases permeation requirements**Duration of Protection:** >60 min but < 2 h

Acetone—>134 min before penetration—<0.01 permeation—ASTM F 739

Acetonitrile—>180 min before penetration—<0.01 permeation—ASTM F 739

Ammonia—>180 min before penetration—<0.05 permeation—ASTM F 739

1,3, Butadiene—>180 min before penetration—<0.01 permeation—ASTM F 739

Carbon disulfide—111 min before penetration—<0.01 permeation—ASTM F 739

Carbonyl chloride—>60 min before penetration—<0.0005 permeation—ASTM F 739

Chlorine—>180 min before penetration—<0.03 permeation—ASTM F 739

Cyanogen chloride—>60 min before penetration—<0.00025 permeation—ASTM F 739

Dichloromethane—>62 min before penetration—<0.06 permeation—ASTM F 739
Diethylamine—>180 min before penetration—<0.01 permeation—ASTM F 739
Dimethylformamide—>180 min before penetration—<0.01 permeation—ASTM F 739
Dimethyl sulfate—>180 min before penetration—<0.10 permeation—ASTM F 739
Ethyl acetate—>180 min before penetration—<0.09 permeation—ASTM F 739
Ethylene oxide—>180 min before penetration—<0.01 permeation—ASTM F 739
Hexane—>180 min before penetration—<0.01 permeation—ASTM F 739
Hydrogen chloride—>180 min before penetration—<0.1 permeation—ASTM F 739
Hydrogen cyanide—>60 min before penetration—<0.0054 permeation—ASTM F 739
Methanol—>180 min before penetration—<0.01 permeation—ASTM F 739
Methyl chloride—>180 min before penetration—<0.03 permeation—ASTM F 739
Nitrobenzene—>180 min before penetration—<0.01 permeation—ASTM F 739
Sodium hydroxide—>180 min before penetration—<0.01 permeation—ASTM F 739
Sulfuric acid, concentrated—>180 min before penetration—<0.1 permeation—ASTM F 739
Tetrachloroethylene—>180 min before penetration—<0.01 permeation—ASTM F 739
Tetrahydrofuran—>113 min before penetration—<0.02 permeation—ASTM F 739
Toluene—>180 min before penetration—<0.01 permeation—ASTM F 739

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** Passed, per NFPA 1991–2005 Edition 400 g (14.11 oz) load
- **Upper Puncture Resistance (ASTM F 1342):** Passed NFPA 1991, 2005
- **Sole/Heel Abrasion (ASTM D 1630):** Passed NFPA 1991, 2005
- **Sole/Heel Puncture Resistance (ANZI Z41):** Passed test NFPA 1991, 2005
- **Toe Impact/Compression Resistance (ASTM Z41):** Passed test NFPA 1991, 2005
- **Resistance (Other):** The upper material is cut, puncture, and abrasion resistant; the upper and sole material degrades when exposed to petroleum, oil, and lubricants. Boot has an impact-resistant toe cap and puncture resistant midsole. Degradation not significant over designed service life of boot. Electrical Hazard Rated—ANSI Z41 PT99 EH.

HUMAN FACTORS

Boot Weight/Size: 3.08 kg to 3.18 kg (6.8 lb to 7 lb). Weights range 2.86 kg to 3.58 kg (6.3 lb to 7.9 lb) sizes 7 thru 13. Size 13 oversized footbed design will accommodate foot sizes up to 16.

Comfort (ASTM F 1154): Independent field trials indicate product is easiest to don and doff and most comfortable when wearing an encapsulated suit

Traction/Skid Resistance (ASTM F 489): Passes NFPA 1991, 2005

Tread: Cleated

Don/Doff Information: Full gusseted opening allows for easier donning and doffing and is secured with replaceable stretch fasteners. Can be donned and doffed in 0 s to 30 s.

DESIGN/CONFIGURATION

Boot Height: 27.94 cm (11 in); boot does not have cut-off bands

Overboot Capability: Oversized foot bed comfortably accommodates a Level A suit

Boot Closure: Replacement loops are available; stretch fasteners include finger tab for easy manipulation when wearing gloves

LOGISTICS

TDP (Technical Data Package): Technical Data Package available at www.tingleyrubber.com

Shelf Life: Shelf life over 5 yr. Product history established 1996.

Shelf life is diminished under storage conditions such as high temperature and humidity, excessive exposure to UV, or cross contamination from other stored items.

Storage Conditions: 4 °C to 32 °C (40 °F to 90 °F); 20 % to 60 % rh. Shelf life is diminished under storage conditions such as high temperature and humidity, excessive exposure to UV, or cross-contamination from other stored items.

Maintenance Required: Annually

Sizes Available: Size 7 to 13. Oversized design will accommodate foot sizes up to 16. Half sizes are not available; widths are graduated by size.

Size Range: Will accommodate sizing from boot sizes 6 to 16.

Health Hazards and Safety: No latex or other allergens. MSDS is not available.

Warranty: Tingley Rubber Corporation warrants its products to be free of defects in material and workmanship at the time of original sale

GENERAL

Thorogood Neoprene Rubber Structural and Haz-Mat Fire Boot

Model: 807-6004

Weinbrenner Shoe Company
108 So. Polk St.
Merrill, Wisconsin 54452
Jerry Hess
715-536-5521 (Tel)
715-536-1172 (Fax)
j.hess@mindspring.com

<http://www.weinbrennerusa.com>
Responder Knowledge Database (RKB), UL

Updated: January 13, 2006

Unit Cost: \$95



OSHA EPA Level: Class 1/Level B

Certification Status: NFPA 1992 (2005 Edition)

Certification Organization: NFPA 1971 (structural fire fighting) and NFPA 1992 (Splash-Protective for Haz-Mat). In addition to NFPA 1992, this product has also been certified to NFPA 1971 Standard on Protective Ensemble for Structural Fire Fighting 2000 Edition, tested and certified by Underwriters' Laboratories, Inc.

Certification #: SA11764

Date Certified/Expected: Not specified

Availability: In stock

Other Certifications: ANSI Z41 PT99 M I/75 C/75 EH PR, testing conducted by Underwriters' Laboratories, Inc.

Independent Testing: Not specified

Test Conducted: Not specified

Test Dates: Not specified

Material Technology: The Hellfire Structural fire protection capabilities come from multiple layers of flame-suppressing materials. Outside the boot, high temperature-resistant reflective patches reduce heat transference and provide high visibility protection. Inside, a single-pieced 6 mm (0.24 in) thick layer of closed-cell Neoprene sponge material. Neoprene sponge lining provides comfort and insulation that won't absorb perspiration or water. This unique design prevents against steam burn injury when exposed to heat. All materials bonded with adhesives and autoclave vulcanized for a permanent bond. Chemical resistance is provided by a dipped neoprene synthetic latex outer layer that provides a seamless, leak-proof, and highly puncture-resistant barrier. As different classes of liquid chemicals can penetrate different kinds of rubber, the Hellfire Haz-Mat also includes multiple layers of diverse types of rubber. Each layer possesses its own chemical resistance properties, so the total effect is protection from a broad spectrum of various hazardous chemical agents. Puncture- and tear-resistant fabric is obtained by coating both surfaces with natural rubber barrier film layers.

Structure from outside to inside (all materials bonded with adhesives and autoclave vulcanized for a permanent bond):

1. Continuous barrier film of 100 % Neoprene latex, completely encapsulating the boot structure.
2. Puncture-and-tear resistant fabric, coated on both surfaces with natural rubber/synthetic rubber barrier film layers.
3. 6 mm (0.24 in) thick layer of closed cell Neoprene sponge material.
4. Nylon inner lining.

Boot Description: A chemical protection/structural firefighting boot. The upper and sole construction incorporate multiple barrier layers of polymer rubber (polar and nonpolar polymer layers are alternated for the widest possible range of chemical protection). Fully dipped in Neoprene latex for 100 % seamless external barrier-coat sealing. Hand-built, vulcanized construction, incorporating a vulcanized Polyurethane (PU) rubber outsole compounded for chemical resistance and slip resistance, and with anti-slip "lug" tread pattern.

Boot Application: Chemical spills, structural or chemical fire fighting, low temperature and high temperature conditions. Flammable or flash fire environment, submersion in water or any other type of liquid(s), including organic solvents and caustic chemicals, and biological hazards.

Flame Resistance: Certified to both NFPA 1971 and NFPA 1992, Hellfire Structural/Haz-Mat Boot includes multiple layers of flame-suppressing materials. High temperature-resistant reflective patches on outside of boot minimize heat transference.

EOD Capability: Not EOD compatible

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 1 CWA permeation resistance (100 g/m²)

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats)

TIMs Protected Against: Meets NFPA 1994 Class 1 liquid/gases permeation requirements

Duration of Protection: 3 h

Not specified

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** >50 mm (1.97 in) travel, under 800 g (28.22 oz) load
- **Upper Puncture Resistance (ASTM F 1342):** 140 N (31.2 lbf)
- **Sole/Heel Abrasion (ASTM D 1630):** Rating = 311
- **Sole/Heel Puncture Resistance (ANZI Z41):** 1.29 kN (290 lbf)
- **Toe Impact/Compression Resistance (ASTM Z41):**
 - Impact—2.24 cm (0.88 in) clearance at 101.7 J (75 ft•lbf)
 - Compression—18570 N (4175 lbf) at test termination
- **Resistance (Other):** The upper material is cut, puncture, and abrasion resistant; upper/sole material does not degrade when exposed to petroleum, oil, or lubrication. Boot exceeds ANSI and CSA standards for dielectric footwear; boot has an impact-resistant toe cap and puncture resistant midsole.

HUMAN FACTORS

Boot Weight/Size: 3.13 kg (6.9 lb) for size 9 medium width. Lightweight, generous cushioning [6 mm (0.23 in)] of closed-cell neoprene sponge) reduces fatigue. Thorogood has cleverly used the insulation layer as an active structural element to reduce overall boot weight. Meanwhile flat-tacked pull loops resist skin abrasion around the calf area.

Comfort (ASTM F 1154): All respondents report the highest level of comfort. Special comfort features include the lightweight, closed-cell Neoprene sponge lining, excellent fit of the boot last, and closed-cell removable PU insole with arch support.

Traction/Skid Resistance (ASTM F 489): Dry surface—0.84; wet surface—0.83

Tread: “Traction Lug” sole, broad treads with deep channels

Don/Doff Information: Pull-on loops on either side of each boot; donned and doffed in 0 s to 30 s

DESIGN/CONFIGURATION

Boot Height: 40.64 cm (16 in); boot does not have cut-off bands

Overboot Capability: Boot is limited to only wearing socks inside the boot

Boot Closure: Closures not available

LOGISTICS

TDP (Technical Data Package): Not applicable (this product is NFPA certified)

Shelf Life: >20 yr. Basis: All rubber compounds used in manufacture of this product are highly protected with antioxidant chemicals. High-quality carton packaging provides further protection from dirt, environmental contaminants and physical damage in storage.

Storage Conditions: <32 °C (90 °F); 0 % to 80 % rh

Maintenance Required: No maintenance is required during storage

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. Half sizes are available. Women size 5 through 10, narrow, medium, wide. Men size 5 through 15, medium, wide, X-wide.

Size Range: Not specified

Health Hazards and Safety:

- **Latex/Allergens:** The “latex” outer barrier is synthetic Neoprene
- **MSDS:** Available for PU outsole rubber and Neoprene (polychloroprene) latex

Warranty: Boot is warranted free of manufacturing defects for 1 yr; the outsole is warranted to remain serviceable for 18 mo.

GENERAL**AirBoss Lightweight Overboot****Model:** ALO (NSN 8430-99-869-0394 to 0399; 8430-99-869-0538 to 0543)

AirBoss Engineering Products, Inc.
 881 Landry
 Acton VaAle, Quebec
 J0H 1A0
 Genevieve Lecours
 450-546-2776 [ext. 337 (Tel)]
 450-546-3735 (Fax)
 Genevieve.lecours@airboss-acton.com

<http://www.airboss-acton.com>

Updated: January 13, 2005**Unit Cost:** The ALO is ~\$33 to \$40 depending of quantity, packaging, and features**OSHA EPA Level:** Class 1/Level B**Certification Status:** Planned for submission**Certification Organization:** The ALO is planned for submission to NFPA 1994, 2005 Edition, Class 3 certification by Underwriters Laboratories**Certification #:** Not applicable**Date Certified/Expected:** December 2005**Availability:** In stock**Other Certifications:** Not specified**Independent Testing:** Battelle, Geomet, DRDC Suffield, DSTL Porton Down, Akron Rubber**Test Conducted:** CAs TOP 8-2-501, QSTAG 991, Def Stan 93-55, Vapro Mist test with the use of the JSLIST ensemble, Permeation Resistance ASTM F739**Test Dates:** While the ALO is in production each production lot is required to be tested to CAs. The Vapro Mist test was conducted March 2001. The ALO was also tested against TICs in 2003 by Akron Rubber.**Material Technology:** The ALO is made of butyl rubber compound that offers the best CW agent protection. AirBoss Defense is also developing new polymer compounds through a research program to meet protection against TICs/TIMs and flame resistance. This new polymer compound will be ready by October 2005.**Boot Description:** The ALO is a hand-assembled overboot made of extruded butyl rubber. Its closure system consists of 3 elastic loops to ensure a snug fit. The ALO provides more than 24 h protection against all known CAs and can be fully decontaminated.**Boot Application:** Flammable or flash fire environment (October 2005). Submersion in water or any other type of liquid(s). Explosive atmospheres, radiation, and biological hazards.**Flame Resistance:** Flame resistant—The ALO is meeting NFPA 1991 when tested to ASTM F 1358 with afterflame of 0 s and a char length < 4 in**EOD Capability:** Fully antistatic, meeting EN 344 and DIN 4843**References:** USMC—175 000 in use—1 yr—Adam W. Lowery (229-639-5564)

Canadian DND—1 to 25 000 per year in use—5 yr—Dannie Stevens (819-997-0052)

DLO UK MoD—35 000 per year in use—10 yr—Gerry Harvey (+44-1-869-87-59-40)

Lantor UK—19 000 in use—1 yr—John Retford (+44-1-204-85-50-00)

CAPABILITIES**CAs Protected Against:** NFPA 1994 Class 1 and NFPA 1991. Both NFPA 1991 and 1994 standards require 1 h protection against CAs. The ALO offers more than 24 h protection against CAs when tested by TOP 8-2-501 procedure.**BAs Protected Against:** Exceeds NFPA 1994 liquid penetration protection. Both NFPA 1991 and 1994 standards require 1 h protection against BW agents. The ALO offers more than 24 h protection to aerosol particles when tested in the VAPRO Mist test chamber in conjunction with the JSLIST ensemble.**TIMs Protected Against:** Meets 1994 plus 1991/1992 modified ASTM F1001 battery of 7 chemicals (penetration resistance only). Provides permeation resistance for some chemicals (but not for one of the complete batteries listed above). The ALO

offers more than 60 min of protection when tested in accordance of ASTM F739 against the following TICs/TIMs: acetone, ethyl acetate, methanol, sodium hydroxide, sulfuric acid, ammonia gas, butadiene gas, and chlorine gas.

Duration of Protection: ALO is designed to offer more than 24 h against CAs. Based on the NFPA 1994 Class 1 agents concentration of 100 g/m², it is anticipated that the ALO will have recommended mission duration of 3 h to 4 h. The mission duration will be >6 h against agents concentration of 10 g/m² as specified in Class 3 requirements of the NFPA 1994.

Acetone cyanohydrin—75-86-5—>480 min before penetration—EN 374

Ammonia—7664-41-7—>480 min before penetration—EN 374

Arsine—7784-42-1—>480 min before penetration—Based on the butyl compound

Chlorine—7782-50-5—No breakthrough after 480 min—ASTM F739

Ethylene oxide—75-21-8—>120 min before penetration—Based on the butyl compound

Fluorine—7782-41-4—>60 min before penetration—Based on the butyl compound

Formaldehyde (37%)—50-00-0—>480 min before penetration—Based on the butyl compound

Hydrogen bromide—10035-10-6—>480 min before penetration—Based on the butyl compound

Hydrogen chloride—7647-01-0—>480 min before penetration—Based on the butyl compound

Hydrogen cyanide—74-90-8—>480 min before penetration—Based on the butyl compound

Hydrogen sulfide—7783-06-4—>480 min before penetration—Based on the butyl compound

Nitric acid, fuming—7697-37-2—>60 min before penetration—Based on the butyl compound

Sulfur dioxide—7449-09-05—>120 min before penetration—Based on the butyl compound

Sulfuric acid, concentrated—7664-93-9—96 %—No breakthrough after 480 min—0—ASTM F739

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** To be confirmed
- **Upper Puncture Resistance (ASTM F 1342):** To be confirmed
- **Sole/Heel Abrasion (ASTM D 1630):** 69.8 (ASTM D1630)
- **Sole/Heel Puncture Resistance (ANZI Z41):** Not specified
- **Toe Impact/Compression Resistance (ASTM Z41):** Not specified
- **Resistance (Other):** The upper material is cut, puncture, and abrasion resistant; the upper and sole material does not degrade when exposed to petroleum, oil, and lubricants; the upper and sole material is antistatic. The ALO will meet these standards at the end of our ongoing development program, in October 2005.

HUMAN FACTORS

Boot Weight/Size: 1.11 kg (2.45 lb) for large size

Comfort (ASTM F 1154): No ASTM F 1154 qualitative evaluation

Traction/Skid Resistance (ASTM F 489): The ALO offers a static coefficient of 1.0 on dry and wet conditions, tested by UL

Tread: Not specified

Don/Doff Information: Boot offers a built-in mechanism to aid in donning. The ALO has a slip-on stripe to ease donning and doffing. The average donning and doffing time of the ALO <30 s.

DESIGN/CONFIGURATION

Boot Height: 26.67 cm (10.5 in); boot does not have cut-off bands

Overboot Capability: The ALO is an overboot

Boot Closure: The ALO closure system offers 3 adjustable elastic loops that can be adjusted once it is closed, i.e., ski boots, to provide adequate ankle support. Tightness around the ankle can be adjusted to accommodate a variety of sizes. Boot closures are easily manipulated while wearing protective gloves.

LOGISTICS

TDP (Technical Data Package): Technical Data Package not available

Shelf Life: 11 yr to 15 yr

Storage Conditions: -35 °C to 50 °C (-31°F to 122 °F); 40 % to 80 % rh

Maintenance Required: The ALO has been manufactured for over 15 yr and samples are still in archives and tested periodically to check physical properties and chemical resistance

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. Half sizes and widths are not available.

Size Range: The ALO will cover sizing from 4 to 16

Health Hazards and Safety:

- **Latex/Allergens:** No latex or other allergens
- **MSDS:** MSDS Code: Boot AFS

Warranty: The ALO is guaranteed for 12 mo against material and manufacturing defects from date of delivery

GENERAL**North SF Chem Overboot****Model:** 11095

North Safety Products
 2000 Plainfield Pike
 Cranston, Rhode Island 02921
 Lynn Aurelius
 858-722-1200 (Tel)
 309-403-3549 (Fax)
 lynn.aurelius@northsafety.com

<http://www.northsafety.com>
 Responder Knowledge Database (RKB)

Updated: March 15, 2006**Unit Cost:** \$18**OSHA EPA Level:** Class 1/Level B**Certification Status:** No third-party certifications in RKB for this product**Certification Organization:** North SF PVC Overboot stock no. 11095, although not certified to NFPA standards, by virtue of its construction and formulation, meets U.S. Military Specification MIL-O-43995C**Certification #:** MIL-O-43995C**Date Certified/Expected:** Not applicable**Availability:** Manufactured on demand**Other Certifications:** Tested to chemical requirements MIL-O-43995C and commercial spec A-A-59520**Independent Testing:** Geomet Technologies**Test Conducted:** CA testing per MIL-O-43995C**Test Dates:** Not specified**Material Technology:** Made of specially formulated PVC compound to resist variety of TIMs and Cas. Injection-molded PVC one-piece construction.

Boot Description: North SF Chem Overboot Stock No. 11095 are injection-molded PVC overboots especially molded to accommodate a variety of over-the-foot safety footwear without difficulty. Chem overboot to fit over bulky footwear. Kick-off lugs are permanently molded on the heel and extra large to help doffing. Dual compounding permits a light, stretchable upper to be molded to a high-abrasion and slip-resistant sole. Self cleaning treads on the outsole keep gripping edges free for better traction. Wedged outsole with knobby treads. Boot buttons are molded as part of making the boot, cannot leak like add-on snaps. Rugged elastic loops are attached on one side and draw across the generous gusset to fit snugly and comfortably with plenty of flex. Tabbed grips are stitched on the closure loops-can be easily grasped while wearing gloves. Made in the USA. All black.

Boot Application: North SF CHEM overboots with its specially formulated PVC compound will withstand exposure to CA like sarin and mustard. Submersion in water or any other type of liquid(s) and biological hazards. LE/military for chem/bio protection.

Flame Resistance: Not flame resistant**EOD Capability:** Not EOD compatible**References:** Many LE organizations have used 300 000 pairs for 2.5 y**CAPABILITIES****CAs Protected Against:** North SF CHEM boots were found to be compliant with MIL-O-43995C when tested against sarin and mustard**BAs Protected Against:** Not specified**TIMs Protected Against:** Not specified**Duration of Protection:** Not specified

Not specified

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** Yet to be tested
- **Upper Puncture Resistance (ASTM F 1342):** Yet to be tested

- **Sole/Heel Abrasion (ASTM D 1630):** Yet to be tested
- **Sole/Heel Puncture Resistance (ANZI Z41):** Not tested
- **Toe Impact/Compression Resistance (ASTM Z41):** Note that the North SF CHEM is an overshoe product and hence is not constructed with steel toe offering impact and protection. Generally this is worn over the safety footwear offering the toe protection but not the chemical resistance.
- **Resistance (Other):** The upper and sole material does not degrade when exposed to petroleum, oil, and lubricants. The construction is one piece molded overboot to eliminate possible leaks. Reinforced in high-stress areas.

HUMAN FACTORS

Boot Weight/Size: Not specified

Comfort (ASTM F 1154): No ASTM F 1154 qualitative evaluation

Traction/Skid Resistance (ASTM F 489): Yet to be tested

Tread: Boots' soles are made with PVC compound offering slip resistance while maintaining abrasion resistance for longer service life. Self-cleaning outsole.

Don/Doff Information: North SF Chem overboots with their open gusset construction are easy to pull on in 0 s to 30 s. The product is recognized for easy on and easy off .

DESIGN/CONFIGURATION

Boot Height: 30.48 cm (12 in); boot does not have cut-off bands

Overboot Capability: Boot can be worn over other boots. Boot comes in sizes to accommodate wearing as an overboot.

Boot Closure: Features highly durable injection-molded construction with tabbed grip and elastic loops for easy closing. Boot closures are easily manipulated while wearing protective gloves.

LOGISTICS

TDP (Technical Data Package): Technical Data Package is available

Shelf Life: Shelf of life of 1 yr to 5 yr if boots remain in closed plastic bag

Storage Conditions: Less than or equal to 38 °C (100 °F); preferred storage is 10 °C to 27 °C (50 °F to 80 °F)

Maintenance Required: Since the chemical resistance or other protective properties of North SF CHEM overboots will tend to diminish with wear tear, it is recommended that user maintain this footwear by cleaning it after each exposure. Generally washing with soap and warm water is recommended. It is also suggested that user inspect his/her footwear prior to each use for any damage such as cracks to the footwear. Any evidence of damage should result in taking the footwear out of service. Recognized for easy decontamination.

Sizes Available: Sizes: small (7 and 8), medium (9 and 10), large (11 and 13), and X-large (14 and 15). Half sizes and widths are not available. Boot can easily be worn over other boots and comes in appropriate sizes to accommodate wearing as an overboot. Will fit up to a mens 15 EEE.

Size Range: Not applicable

Health Hazards and Safety:

- **Latex/Allergens:** No latex or other allergens
- **MSDS:** 29 CFR 1910.1200 does not require an MSDS for finished article such as footwear

Warranty: These boots are unconditionally guaranteed to be free from material or workmanship defects for 1 yr from date of purchase

GENERAL***Servus Black Vinyl Overshoe*****Model:** Military BVO (C43995)

North Safety Products
 2000 Plainfield Pike
 Cranston, Rhode Island 02921
 Lynn Aurelius
 800-603-1645 ext 4015 (Tel)
 309-403-3549 (Fax)
 PM/Director-DPGroup
 lynn.aurelius@northsafety.com

<http://www.northsafety.com>

Updated: April 14, 2005**Unit Cost:** \$25**OSHA EPA Level:** Class 1/Level B**Certification Status:** Not certified**Certification Organization:** Slush molded PVC overboot stock number 43995, although not certified to NFPA standards, by virtue of its construction and formulation used, it meets U.S. Military Specification MIL-O-43995C**Certification #:** MIL-O-43995C**Date Certified/Expected:** Not applicable**Availability:** Manufactured on demand**Other Certifications:** These overshoes are compliant with MIL-O-43995C specifications physical and chemical resistance requirements**Independent Testing:** Akron Rubber Development Laboratories (ARDL), Geomet Technologies, Intertec Testing Services (ITS)**Test Conducted:** Physical Tests were conducted at ARDL; CA tests were conducted @ Geomet Technologies; TIMs tests were conducted @ Intertec Testing Services**Test Dates:** Not specified**Material Technology:** Black Vinyl Overshoes (BVOs) Stock No. 43995 are made of specially formulated slush molding PVC compound to resist variety of TIMs and CAs, i.e., mustard and sarin**Boot Description:** Slush-molded PVC overshoe footwear especially molded for U.S. Military to offer resistance against Cas**Boot Application:** Overboot with its specially formulated PVC compound will withstand exposure to CA like sarin and mustard. Submersion in water or any other type of liquid(s) biological hazards.**Flame Resistance:** Not flame resistant**EOD Capability:** Not EOD compatible**CAPABILITIES****CAs Protected Against:** Tested against mustard and sarin as specified in MIL-O-43995C. Testing was conducted at Geomet Technologies.**BAs Protected Against:** Not specified**TIMs Protected Against:** Tested against TIMs listed in ASTM F1001; testing conducted at Intertec Testing Services**Duration of Protection:** 8 hAmmonia—1000 ppm—>480 min—<0.01 µg/cm²/min permeation—ASTM F 739Carbon disulfide—10 g/m²—>480 min—<0.02 µg/cm²/min permeation—ASTM F 739Chlorine—1000 ppm—>480 min—<0.012 µg/cm²/min permeation—ASTM F 739Ethylene oxide—1000 ppm—>480 min—<0.01 µg/cm²/min permeation—ASTM F 739Hydrogen chloride—1000 ppm—>480 min—<0.01 µg/cm²/min permeation—ASTM F 739Sulfuric acid, concentrated—10 g/cm²—>480 min—<0.01 µg/cm²/min permeation—ASTM F 739**Physical Resistance and Durability:**

- **Upper Cut Resistance (ASTM F 1790):** Yet to be tested
- **Upper Puncture Resistance (ASTM F 1342):** Yet to be tested
- **Sole/Heel Abrasion (ASTM D 1630):** Yet to be tested

- **Sole/Heel Puncture Resistance (ANZI Z41):** Not tested
- **Toe Impact/Compression Resistance (ASTM Z41):** Note that the BVO is an overshoe product and hence is not constructed with steel toe offering impact and protection. Generally this is worn over the safety footwear offering the toe protection but not the chemical resistance.
- **Resistance (Other):** The upper and sole material does not degrade when exposed to petroleum, oil, and lubricants

HUMAN FACTORS

Boot Weight/Size: 2.27 kg (5 lb) for size 12

Comfort (ASTM F 1154): No ASTM F 1154 qualitative evaluation

Traction/Skid Resistance (ASTM F 489): Yet to be tested

Tread: Not specified

Don/Doff Information: BVOs with their open gusset construction are easy to pull on. Can easily slip on and off without using hands, in 0 s to 30 s.

DESIGN/CONFIGURATION

Boot Height: 30.48 cm (12 in); boot does not have cut-off bands

Overboot Capability: Boot can easily be worn over other boots. Boot comes in sizes to accommodate wearing as an overboot.

Boot Closure: Elastic loop; boot closures are easily manipulated while wearing protective gloves

LOGISTICS

TDP (Technical Data Package): Technical Data Package not available

Shelf Life: Shelf of life of 5 yr for Black Vinyl Overboots is determined based on the fact that PVC under normal conditions will not degrade

Storage Conditions: Less than or equal to 38 °C (100 °F)

Maintenance Required: Since the chemical resistance or other protective properties of BVOs will tend to diminish with wear tear, it is recommended that user maintain this footwear by cleaning it after each exposure. Generally washing with soap and warm water is recommended. It is also suggested that user inspect his/her footwear prior to each use for any damage such as crack to the footwear. Any evidence of damage should result in taking the footwear out of service.

Sizes Available: Available in sizes 3 through 18. Half sizes and widths are not available.

Size Range: Not specified

Health Hazards and Safety:

- **Latex/Allergens:** No latex or other allergens
- **MSDS:** 29 CFR 1910.1200 does not require an MSDS for finished article such as footwear

Warranty: These boots are unconditionally guaranteed to be free from material or workmanship defects for 1 yr from date of purchase

GENERAL**Strapper Overboot****Model:** 87050

Onguard Industries
 1850 Clark Road
 Havre de Grace, Maryland 21078
 William Alexander, Chemist
 410-272-2000 [ext 109 (Tel)]
 410-942-0814 (Fax)
 walexander@onguardindustries.com

<http://www.onguardindustries.com>
 Responder Knowledge Database (RKB)

Updated: January 9, 2006**Unit Cost:** \$51**OSHA EPA Level:** Class 3/Level C**Certification Status:** No third-party certifications in RKB for this product**Certification Organization:** No third-party certifications in RKB for this product**Certification #:** Not applicable**Date Certified/Expected:** No third-party certifications in RKB for this product**Other Certifications:** Not specified**Independent Testing:** Not specified**Test Conducted:** Not specified**Test Dates:** Not specified**Material Technology:** Boots are constructed of high viscosity and flexible PVC alloy. Nonabsorbent polyester lining for easy cleaning and quick drying. One-piece injection-molded construction, eliminates seams.**Boot Description:** 43.2 cm (17 in) over-the-boot protection—fits over most shoes and boots**Boot Application:** Excellent for use in emergency response Hazmat environments and site remediation**Flame Resistance:** Not specified**EOD Capability:** Not specified**CAPABILITIES****CAs Protected Against:** Not specified**BAs Protected Against:** Not specified**TIMs Protected Against:** Not specified**Duration of Protection:** Greater than or equal to 60 min but less than 2 h

Not specified

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** Not specified
- **Upper Puncture Resistance (ASTM F 1342):** Not specified
- **Sole/Heel Abrasion (ASTM D 1630):** Not specified
- **Sole/Heel Puncture Resistance (ANZI Z41):** Not specified
- **Toe Impact/Compression Resistance (ASTM Z41):** Not specified
- **Resistance (Other):** Not specified

HUMAN FACTORS**Boot Weight/Size:** >3.2 kg (7 lb) to less than or equal to 4.5 kg (10 lb)**Comfort (ASTM F 1154):** Not specified**Traction/Skid Resistance (ASTM F 489):** Not specified**Tread:** Not specified**Don/Doff Information:** Not specified

DESIGN/CONFIGURATION

Boot Height: 43.2 cm (17 in)

Overboot Capability: Fits over most shoes and boots

Boot Closure: Adjustable polyester strap

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life: Not specified

Storage Conditions: Not specified

Maintenance Required: Not specified

Sizes Available: Not specified

Size Range: Not specified

Health Hazards and Safety:

- **Latex/Allergens:** Not specified
- **MSDS:** Not specified

Warranty: Not specified

GENERAL**Chemical Overshoe****Model:** 87025

Onguard Industries
 1850 Clark Road
 Havre de Grace, Maryland 21078
 William Alexander, Chemist
 410-272-2000 [ext 109 (Tel)]
 410-942-0814 (Fax)
 walexander@onguardindustries.com

http://www.onguardindustries.com
 Responder Knowledge Database (RKB)

Updated: January 9, 2006**Unit Cost:** \$30**OSHA EPA Level:** Class 3/Level B**Certification Status:** No third-party certifications in RKB for this product**Certification Organization:** No third-party certifications in RKB for this product**Certification #:** Not applicable**Date Certified/Expected:** No third-party certifications in RKB for this product

Other Certifications: NFPA 1971 Compliant Structural Fire Fighter Footwear (also referred to in this Guide as NFPA 1971 Compliant Footwear and Footwear). Footwear certified by a private, third party certification organization (Underwriters' Laboratories) to meet at the time of manufacture the design and performance requirements of the NFPA 1971 Standard (2000 Edition).

Independent Testing: Not specified**Test Conducted:** Not specified**Test Dates:** Not specified**Material Technology:** One-piece injection-molded construction, eliminates seams. Overboots are constructed to provide optimal protection.**Boot Description:** 25.4 cm (10 in) over-the-boot protection—fits over most work shoes and boots constructed to provide optimal protection**Boot Application:** Excellent for use in emergency response Hazmat environments and site remediation**Flame Resistance:** Not specified**EOD Capability:** Not specified**CAPABILITIES****CAs Protected Against:** Not specified**BAs Protected Against:** Not specified**TIMs Protected Against:** Not specified**Duration of Protection:** Greater than or equal to 60 min but less than 2 h

Not specified

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** Not specified
- **Upper Puncture Resistance (ASTM F 1342):** Not specified
- **Sole/Heel Abrasion (ASTM D 1630):** Not specified
- **Sole/Heel Puncture Resistance (ANZI Z41):** Not specified
- **Toe Impact/Compression Resistance (ASTM Z41):** Not specified
- **Resistance (Other):** Not specified

HUMAN FACTORS**Boot Weight/Size:** >2.3 kg (5 lb) to less than or equal to 3.2 kg (7 lb)**Comfort (ASTM F 1154):** Not specified

Traction/Skid Resistance (ASTM F 489): Not specified
Tread: 4-way cleated sole design for a self-cleaning, slip resistant sole
Don/Doff Information: Kick-off lug

DESIGN/CONFIGURATION

Boot Height: 25.4 cm (10 in)
Overboot Capability: Fits over most shoes and boots
Boot Closure: Special fold line with noncorrosive snap for snug fit

LOGISTICS

TDP (Technical Data Package): Not specified
Shelf Life: Not specified
Storage Conditions: Not specified
Maintenance Required: Not specified
Sizes Available: Not specified
Size Range: Not specified
Health Hazards and Safety:

- **Latex/Allergens:** Not specified
- **MSDS:** Not specified

Warranty: Not specified

GENERAL

Paul Boyé Overboots

Model: SURBOEXP

Paul Boyé
1564 Route de Lagardelle
31810 Le Vernet, France
Francis A. Brochu
410-939-0816 (Tel)
+33-5-34-48-21-11 (Tel)
+33-5-34-48-21-09 (Fax)
fbrochu@btgtechnologies.com

Responder Knowledge Database (RKB)

Updated: April 15, 2005

Unit Cost: Not specified



OSHA EPA Level: Class 3/Level B

Certification Status: Not certified

Certification Organization: The Paul Boyé overboots has been certified following prEN1511 European standard for “protective clothing against liquid chemicals.” The Paul Boyé overboots are used with Paul Boyé nonpermeable protective garments “TLD” and “CLD” model. They are made with the same 3TOX fabric used to make the Class 3 CLD420 Coverall certified following NFPA 1994-2001.

Certification #: Not applicable

Date Certified/Expected: Not specified

Availability: In stock—no minimum quantity for order. Production capacity of 50 000 overboots per mo.

Other Certifications: Not specified

Independent Testing: IFTH (Institut Français Textile et Habillement), avenue Guy de Collongue-69134 ECULLY (France)

Test Conducted: NF EN 463, Protection against Liquid Chemicals—Determination of resistance to penetration by a jet of liquid (“jet test”). Paul Boyé overboots were tested in combination with “TLD-ARI” chemical protective suit.

Test Dates: January 05, 2002

Material Technology: Paul Boyé overboots are made with 3TOX nonpermeable barrier material. This material is designed to offer an excellent protection against CAs, as well as against common industrial chemicals as hydrocarbons, acids, and alkali. The special composition of 3TOX offers the unique possibility to manufacture protective garments or overboots by welding techniques, known to be safer than stitching assembling regarding CBRN threats. 3TOX fabric is the material used to make the Class 3 CLD420 coverall certified following NFPA 1994-2001. 3TOX material is used worldwide for CBRN protective clothing and has obtained the Swiss label of quality “APPROVED BY SWISS ARMY” (see http://www.approved.ch/product_e.php)

Boot Description: Paul Boyé overboot is composed of a protective welded boot made from 3TOX protective material assembled on a nonslippery outer sole made of nonwoven fabric with rubber dots. The special composition of 3TOX material allows the manufacture of the overboots by welding techniques. No stitching is made through the protective material.

Boot Application: Submersion in water or any other type of liquid(s) and biological hazards

Flame Resistance: Not flame resistant—3TOX material is self-quenching and compliant with EN-13274-4 Standard Method 3

EOD Capability: No test was performed for determining the compatibility with protective bomb suit requirements

References: French Land Forces—120 000 units for 8 yr—M. Plommet

Gendarmerie (France)—25 000 units for 3 yr—Mrs. Blandin (Cellule NRBC)

National Police Agency (France)—15 000 units for 3 yr—M. Couplet

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 3 CA permeation resistance (10 g/m², open top)

Lewisite (L)—10 g/m²—>24 h—FINABEL 0.7.C

VX—10 g/m²—>24 h—FINABEL 0.7.C

Soman (GD)—10 g/m²—>24 h—FINABEL 0.7.C

Tabun (GA)—10 g/m²—>24 h—FINABEL 0.7.C

Sarin (GB)—10 g/m²—>24 h—FINABEL 0.7.C

Mustard (HD)—10 g/m²—>24 h—FINABEL 0.7.C

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (liquid penetration resistance—biological threats). 3TOX material is compliant with NFPA 1994 ASTM F 1671.

TIMs Protected Against: Meets 1994, 1991, and 1992 plus limited vapor (suit test). Provides permeation resistance for some chemicals (but not for one of the complete batteries listed above). Permeation Resistance for chemicals following EN374 and ISO6529 are give in §2.2.

Duration of Protection: From 1 h to 2 h (this limitation is the consequence of the heat-stress due to protective suit wearing rather than protection limitation of Paul Boyé overboots). Paul Boyé overboots are designed to be single-use overboots used with single-use protective garments.

Ammonia—33 min—EN 374

Carbon disulfide—38 min—EN 374

Chlorine—>480 min—EN 374

Hydrogen chloride—382 min—EN 374

Nitric acid, fuming 65 %—>480 min—EN 374

Phosgene—>480 min

Sulfuric acid, concentrated 95 %—>480 min—EN 374

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** Not tested following such standard
- **Upper Puncture Resistance (ASTM F 1342):** Not tested following such standard
- **Sole/Heel Abrasion (ASTM D 1630):** Not tested following such standard
- **Sole/Heel Puncture Resistance (ANZI Z41):** Not tested following such standard
- **Toe Impact/Compression Resistance (ASTM Z41):** Not specified
- **Resistance (Other):** The upper material is not cut, puncture, and abrasion resistant; the upper and sole material does not degrade when exposed to petroleum, oil, and lubricants. As the Paul Boyé overboots are made for single-use, its cut, puncture and abrasion resistances equivalent to the protective suits. However, the nonslippery sole is resistant enough to abrasion for a limited-use.

HUMAN FACTORS

Boot Weight/Size: 0.45 kg (1 lb)—this weight corresponds to the “one-size-fits-all” size

Comfort (ASTM F 1154): No ASTM F 1154 qualitative evaluation

Traction/Skid Resistance (ASTM F 489): Not tested

Tread: Not specified

Don/Doff Information: The Paul Boyé overboots can be donned and doffed by the user without any assistance, even if protective gloves are worn, in 0 s to 30 s

DESIGN/CONFIGURATION

Boot Height: 48.26 cm (19 in)—the overboot

Overboot Capability: The Paul Boyé overboot is designed to be used with any boots and to accommodate all boot sizes. It can easily be worn over other boots.

Boot Closure: Paul Boyé overboots closure is made with laces. Tightness around ankle can be adjusted to accommodate variety of sizes. Boot closures are easily manipulated while wearing protective gloves.

LOGISTICS

TDP (Technical Data Package): Technical Data Package is available on demand (export@paulboye.fr)

Shelf Life: 16 yr to 20 yr. Shelf life is determined by testing the protective properties of the first production of 3TOX protective material (first production 1989).

Storage Conditions: -30 °C to 41 °C (-22 °F to 105 °F); 30 % to 90 % rh. 3TOX material is tested following NF EN ISO 7854 standard for determining the resistance to folding at low temperature [-30 °C (-22 °F)]. 3TOX material keeps its original properties after 500 folding cycles at -30 °C (-22 °F).

Aging during storage is simulated by testing the 3TOX material after 8 d of storage at 41 °C (150°F). No deterioration of the protective properties is observed after such treatment. Aging is also simulated by folding the 3TOX material at 30 °C (86 °F), 90 % rh. No deterioration of the protective properties is observed after such treatment. Paul Boyé overboots should be stored away from UV and electrical devices (ozone production).

Maintenance Required: No maintenance is required during storage

Sizes Available: One size fits all. Half sizes and widths are not available. Size range not specified.

Health Hazards and Safety: No latex or other allergen. MSDS is available.

Warranty: 15 yr of warranty in original packaging (by observing the storage conditions)

GENERAL**Lanx Chemical Protective Boot Liner****Model:** CPU-BL

Lanx Fabric Systems
 9947 Hull Street Road, Suite 280
 Richmond, Virginia 23236
 Randall D. Lofland
 804-423-5798 (Tel)
 804-423-5799 (Fax)
 lanx@earthlink.net

<http://www.lanxfabrics.com>
 Responder Knowledge Database (RKB)

Updated: April 22, 2005**Unit Cost:** \$38 for standard design**OSHA EPA Level:** Class 3/Level B**Certification Status:** Other**Certification Organization:** Lanx Type I fabric meets Military Specification MIL-U-44435. NFPA standards are written for barrier technologies.**Certification #:** Not applicable**Date Certified/Expected:** Not applicable**Availability:** Manufactured on demand—4 wk depending on volume; no minimum order**Other Certifications:** MIL-U-44435 fabric-approved boot liner. Boot liner approved by U.S. military.**Independent Testing:** Edgewood Chemical Biological Center**Test Conducted:** Air-Permeable Charcoal Impregnated Suits to Challenge by Chemical and Biological Warfare Agents and Simulants**Test Dates:** September 2002**Material Technology:** The Lanx Chemical Protective Boot Liner is an air permeable, vapor protective boot liner for wear beneath shoes and duty boots. The boot liner is manufactured with Lanx Type I fabric which is JSLIST approved. Lanx is air permeable.**Boot Description:** Two boot liner designs exist. Design 1—flat sock with one seam running from front to back (beneath the sole of the foot). Design 2—sock with a sole and Velcro closures which open at the top and run down to the ankle.**Boot Application:** To be worn beneath footwear in a chemical warfare environment**Flame Resistance:** No details**EOD Capability:** In use with Med-Eng Systems bomb suits**References:** U.S. Military DeMil workers for 10 yr**CAPABILITIES****CAs Protected Against:** Meets protective requirements of MIL-U-44435**BAs Protected Against:** Not specified**TIMs Protected Against:** No TICs/TIMs data. Most TICs/TIMs are respiratory threats.**Duration of Protection:** 3 h to 16 h

Not specified

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** Not tested
- **Upper Puncture Resistance (ASTM F 1342):** Not tested
- **Sole/Heel Abrasion (ASTM D 1630):** Not tested to NFPA standards
- **Sole/Heel Puncture Resistance (ANZI Z41):** Not tested to NFPA standards
- **Toe Impact/Compression Resistance (ASTM Z41):** Not specified
- **Resistance (Other):** It is a boot liner (sock), not outerwear boot, therefore the upper material is not cut, puncture, and abrasion resistant

HUMAN FACTORS

Boot Weight/Size: <0.23 kg (< 0.5 lb)

Comfort (ASTM F 1154): No ASTM F 1154 qualitative evaluation

Traction/Skid Resistance (ASTM F 489): Not applicable

Tread: Not applicable

Don/Doff Information: Boot liner is easy to put on and take off like most socks; donned and doffed in 0 s to 30 s

DESIGN/CONFIGURATION

Boot Height: 30.5 cm (12 in); boot does not have cut-off bands

Overboot Capability: Not applicable

Boot Closure: Velcro or hook/loop closure on Design No. 2

LOGISTICS

TDP (Technical Data Package): To purchase, visit www.lanxfabrics.com and use order form. Credit card or purchase order accepted.

Shelf Life: 11 yr to 15 yr. Annual Vertrel testing of original fabric production (1991).

Storage Conditions: Do not store in direct sunlight

Maintenance Required: Launder as needed per directions

Sizes Available: Small, medium, large, X-large, and XX-large. Stretchable fabric so half-sizes not needed; stretchable fabric contends with width variation.

Size Range: Will accommodate sizing from boot sizes 6 through 15

Health Hazards and Safety:

- **Latex/Allergens:** No latex or other allergens
- **MSDS:** MSDS is available

Warranty: All boot liners are manufactured to specification. All goods received that are damaged or out of specification will be replaced at no charge if manufacturer is at fault.

GENERAL

AirBoss-Defense CBRN Fire Boot “The BOSS”

Model: 4098

AirBoss Engineering Products, Inc.
881 Landry
Acton Vale, Quebec
J0H 1A0
Genevieve Lecours
450-546-2776 [ext. 337 (Tel)]
450-546-3735 (Fax)
Genevieve.lecours@airboss-acton.com

<http://www.airboss-acton.com>
Responder Knowledge Database (RKB)

Updated: October 19, 2006

Unit Cost: Not specified



OSHA EPA Level: Class 1/Level A

Certification Status: NFPA 1971 (2000 Edition)

Certification Organization: NFPA 1971 (2007 Edition) pending

Certification #: QGVK.SA9427

Date Certified/Expected: Not specified

Availability: Immediately

Other Certifications: Not specified

Independent Testing: CBRN Test Methods: TOP 8-2-501 (DRDC Suffield); Def Stan 93-55 (DSTL Porton Down); Whole Boot Test (DSTL Porton Down)

TICs Test Method: ASTM F 739-99a

Test Conducted: Not specified

Test Dates: Not specified

Material Technology: This Fire Fighter boot is built of several layers of butyl and natural rubber that offer flame, heat, and CA resistance. It has been also tested for CBRN resistance. The Boss comes with a Breathoprene™ removable molded polyurethane insole, for breathability, great compression set, and shock absorption.

Boot Description: Black with grey reflective trim. Made from totally new AirBoss Defense tooling. The foot form (“last”) used to build these boots has been optimized for comfort and fit. Innersole system: Next to your foot, a medium density footbed further cushions impact and creates a rebound effect to return walking energy. Contoured for comfort and support, this removable footbed is lined with Breathoprene™. Lightweight, up to 20 % lighter than standard rubber fire boots, the boot “The Boss” Ultimate Fit provides superior protection in a compact design.

Boot Application: CBRN applications, firefighting

Flame Resistance: 3M Scotchlite™ flame resistant

EOD Capability: Not specified

CAPABILITIES

CAs Protected Against: CBRN

BAs Protected Against: CBRN

TIMs Protected Against: ASTM F 739-99a. TICs resistance results are available on request.

Duration of Protection: 24 h

24 h of protection against sulphur mustard (HD) and soman (GD)

Physical Resistance and Durability:

- **Upper Cut Resistance (ASTM F 1790):** Upper cut resistance
- **Upper Puncture Resistance (ASTM F 1342):** Sole and heel
- **Sole/Heel Abrasion (ASTM D 1630):** Not specified
- **Sole/Heel Puncture Resistance (ANZI Z41):** Boot toe impact
- **Toe Impact/Compression Resistance (ASTM Z41):** Boot toe impact
- **Resistance (Other):** Steel toe and steel plate: C.S.A. protective footwear; Steel shank: Double ridged steel

HUMAN FACTORS

Boot Weight/Size: 2.73 kg (6 lb) for size 9

Comfort (ASTM F 1154): Removable molded polyurethane insole, for breathability, great compression set, and shock absorption.

Traction/Skid Resistance (ASTM F 489): Not specified

Tread: One piece molded tractor design for more adherence and durability

Don/Doff Information: For quick donning and easy hanging

DESIGN/CONFIGURATION

Boot Height: Front 38 cm (15 in) high. Back 30.5 cm (12 in). Boot does not have cut-off bands.

Overboot Capability: Not applicable

Boot Closure: Closures not available

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life: Not specified

Storage Conditions: -32 °C to 52 °C (-25 °F to 125 °F); from 30 % to 80 % rh. Do not store in direct sunlight.

Maintenance Required: Not specified

Sizes Available: 4 to 15F

Size Range: 4 to 15F

Health Hazards and Safety:

- **Latex/Allergens:** Natural rubber
- **MSDS:** Not specified

Warranty: 12 mo against material and manufacturing defects from date of delivery

APPENDIX H—PROTECTIVE GLOVES DATA FIELDS

APPENDIX H—PROTECTIVE GLOVES DATA FIELDS

Thirty-six fields were used to provide information relating to protective gloves. The 36 data fields are comprised of data fields from the market survey vendor questionnaire requesting information about their protective gloves. Because of the database limitations, several data fields on the vendor questionnaire were combined, but all the vendor-supplied information was entered into the database. All data fields were developed using input from the emergency responder community.

The data sheets are grouped according to the following four parameters and the number of data fields in each parameter:

- General (16 data fields).
- Capabilities (6 data fields).
- Human Factors (6 data fields).
- Logistics (8 data fields).

1.0 General

1.1 Product Information

Product information, including name, model, and/or stock number, is used to identify the protective gloves. The stock and/or model number indicates the number(s) that are used to uniquely identify the item. It should include the stock identification or national stock number, if the item has one.

1.2 Manufacturer Information

This data field identifies the company that manufactured the protective glove (to include the name, address, telephone and fax number, point of contact, email address, and manufacturer website).

1.3 Source

Source indicates where the protective glove information was obtained. Potential sources include past market surveys, internet websites, conferences, or commerce business daily announcements.

1.4 Information Last Updated

This data field indicates when the information was last updated by the vendor.

1.5 NFPA Certification Status

This data field indicates if the product has been certified to NFPA standards, such as NFPA 1994 (2001 Edition) and includes the certification organization, the certification number, and

the certification date. It also indicates the prognosis for future certification. Classifications for stand-alone protective gloves may include NFPA 1994 Class 3 or NFPA 1992 (2005 Edition).

1.6 Certification with Ensemble

This data field identifies the ensembles (with vendor and model number with which the glove is certified, sold, or recommended for use).

1.7 Other Certifications

Certifications that the glove may have received other than NFPA 1994 (i.e., ANSI Z41 or mil-standards, or NFPA other than 1994, etc.) should be included in this data field.

1.8 Independent Testing Information

This data field includes any test data obtained from sources regarding any part of the equipment (e.g., validation testing including materials and ensemble testing such as abrasion, tear, wear, burst, and permeation testing). Human factors testing results should be included as well (either quantitative or qualitative).

1.9 Technology

This data field identifies the material or process by which the protective glove provides protection against CBRN and/or TICs/TIMs. Traditional hazardous materials response gloves are constructed from nonpermeable barrier films, membranes or rubber materials. Military chemical protective gloves couple inner adsorptive carbon layers with liquid resistant outer shell textiles. New technologies such as selectively permeable and semi-permeable membranes have been developed and field evaluated.

1.10 Protective Glove Description

This data field provides an overall description of the glove. Descriptions should include specifics on glove interface, gauntlet length, etc.

1.11 Protective Glove Application

This data field identifies the areas where the glove is most likely to be used per vendor or manufacturer recommendation (e.g., tactical operations, crisis management, etc.), or those areas where the glove should not be used (i.e., in a flammable environment, etc.).

1.12 Flame-Resistant Material

This data field includes if the glove is made using flame-resistant material (as demonstrated by meeting NFPA 1991 material flame resistance requirements or by testing to ASTM D 6413 or ASTM F 1358).

1.13 EOD Compatibility

This data field identifies the ability of the glove to be used with an EOD (protective bomb suit) protective system.

1.14 Unit Cost (MSRP)

This data field provides the estimated cost of a complete glove system.

1.15 Availability

Availability indicates the lead time for acquiring initial quantities of protective gloves after the order has been placed. The data field also includes whether the glove is in stock or if it is manufactured on demand.

1.16 References/User(s) of Product

*This data field identifies organizations (i.e., military use, commercial applications, civil-service instrument, etc.) that are currently using the piece of equipment. This information may include the average number of units each client has in operation and the average number of years these units have been in use. **References must be verified with consent from the users before including the contact information.***

2.0 Capabilities

The ability of the protective glove to provide the required barrier protection to the wearer from CWAs, BWAs, and TICs/TIMs is the primary capability requirement.

2.1 Chemical Agents Protected Against

This data field indicates the type and state (i.e., liquid, vapor, or aerosol) of CAs the glove protects against. The most common types of classic CAs are the nerve and blister agents. Nerve agents include GA (tabun), GB (sarin), GD (soman), GF, and VX. Blister agents include H and HD (sulfur mustards), HN (nitrogen mustard), and L (lewisite). This field should include details on the types of testing and the results related to manufacturer testing.

2.2 Biological Agents Protected Against

This data field indicates the type and state (i.e., liquid, vapor, or aerosol) of BAs the glove protects against. Classical BA types include bacteria (anthrax), rickettsia (typhus), toxins (botulinum toxin), and viral smallpox). This field should include details on the types of testing and the results related to manufacturer testing.

2.3 Toxic Industrial Chemicals/Material Protected Against

This data field indicates the type and state (i.e., liquid, vapor, or aerosol) of TICs/TIMs the glove protects against. TICs/TIMs are used in a variety of settings such as manufacturing facilities, maintenance areas, and storage areas.

2.4 Duration of Protection

This data field indicates the amount of time the protective glove provides adequate protection. Since duration varies depending on the concentration of agent, type of agent, and environmental conditions, duration will be given with respect to specific conditions. NFPA 1994 requires 60 min (it is important to note that most missions are around 90 min) of protection; however, many protective gloves exceed this requirement so it is reasonable to assume that protective gloves can offer 2 h, 3 h, or 4 h of protection.

2.5 Physical Resistance and Durability

This criterion addresses the physical strength of the glove by describing its tear, cut, puncture, and abrasion resistance. This data field also includes the resistance of the glove to degradation from petroleum, oils, and lubricants (POLs). The user community expressed the importance of this criterion. They indicated that if you cut or tear your glove, you have compromised the glove's ability to protect against the chemicals and biological agents.

Cut and puncture resistance (ASTM 1790 and ASTM 1342), respectively, and abrasion resistance (ASTM 3389) based on the glove durability performance measures (NFPA 1994 Paragraphs: 7.1.3.2 & 3; 7.2.3.3 & 7.2.3.4; and 7.3.3.4 & 5 through 2.5.3)¹ should be provided.

2.6 Environmental Conditions

This data field focuses on glove performance during hot weather and cold weather. The environmental performance of the glove is based on environmental performance measures (NFPA 1994 Paragraphs: 7.1.3.4, 7.2.3.5, & 7.3.3.6). Cold temperature performance test include NFPA 1991 and NFPA 1994 Class 1, 2, & 3: Cold Temperature Performance Test (ASTM D 747).

3.0 Human Factors

3.1 Grip Texture

This data field indicates how well objects can be picked up or manipulated while wearing a specific glove. Attributes may include textured gripping, rounded fingertips, and comparable performance under wet and dry conditions. Enhanced grip texture is a desirable feature on a comfortable glove.

¹ <http://www.tnema.org/Library/Misc/1994.pdf>

3.2 Comfort

Comfort indicates the suitability of the glove in the work environment on the basis of comfort, fit, form, function, and integrity and is based on ASMT F 1154 (Standard Practice for Qualitatively Evaluating the Comfort, Fit, Function, and Integrity of Chemical-Protective Suit Ensembles). ASMT F 1154 is a complex process based on wearer feedback.

3.3 Dexterity

Dexterity is the ability to manipulate fine instruments and pick up fine objects. These tests are based on a set performance reduction compared to bare hand control. Performance reduction is based on a percent decrease in manipulation while wearing the gloves compared with bare hand control. The scale ranges from 200 % to 450 % to 600 %. These values compare to NFPA 1994 Class 3, 2, and 1, respectively. It is assumed that the thickness of the glove material will influence this criterion. The dexterity performance reduction (%) is based on ASTM F 2010 Test Method—part of NFPA 1991, 1992, and 1994 standards.

3.4 Don/Doff Information

This data field refers to the ease in which the glove can be removed, especially when it has been worn for an extended period of time (e.g., 1 h).

3.5 Ease of Entry and Exit

This data field refers to the ability to enter and exit the glove (that is secured to the ensemble) while in the full encapsulated suit. Removing one's hand from the outer glove to activate communications equipment or to adjust equipment may be necessary and thus warrant ease of exiting from and/or entering into the glove.

3.6 Gauntlet Length

NFPA 1994 (par. 6.3.2) requires that a protective glove must extend at least 1 in beyond the wrist crease. Gauntlet length can be important when the glove is taped to this suit (i.e., if the gauntlet length is too short, it may cause the responders' arms to be restricted when the glove is taped to the ensemble).

4.0 Logistics

4.1 Technical Data Package

A technical data package (TDP) provides instruction with respect to maintenance and shelf life, the relevant factors to be considered are maintenance requirements, in-service performance and inspection procedures, environmental storage conditions, and estimated shelf life.

4.2 Package Shelf Life

This data field considers the length of time an unopened package of gloves can be reasonably stored under normal storage conditions without compromising the effectiveness of the gloves. Shelf life for sealed packages under normal storage conditions can typically be 5 yr, 10 yr, or as long as 15 yr. In some cases, gloves are stored in extraordinary storage conditions, which could shorten the shelf life.

4.3 Out of Package Shelf Life

This data field will indicate the life of the glove after it has been removed from its protective packaging. Shelf life for gloves removed from their package (to be carried by the user) would likely be shorter than those remaining in the package. Some gloves should be used immediately, could deteriorate after 3 mo, or be effective for over 1 yr.

4.4 Storage Conditions

This data field indicates the recommended storage procedures and environment, and includes any factors that decrease shelf life (e.g., UV, critical temperature). This data field also includes specific test data if available.

4.5 Sizes Available

This data field includes the number and the variety of sizes available to the first responder community. There should be enough sizes to adequately fit most of the members of the response team, both male and female. The NFPA 1994 and NFPA 1991 Standards requires at least five glove sizes.

4.6 Health Hazards and Safety

This data field identifies all materials associated with the protective gloves that possess a potential health hazard (especially latex or other allergens).

4.7 Material Safety Data Sheet

A material safety data sheet (MSDS) is required if any of the materials used to manufacture the equipment possess a potential health hazard.

4.8 Warranty

Warranty is the length of time the protective glove is guaranteed by the manufacturer, including the terms of the warranty (parts and labor). This data field also includes specific details on what is covered in the warranty, along with the effective lifetime of the warranty, any restrictions in place by the manufacturer, the specific parts and labor that are covered, and the expected useful lifetime of the equipment.

APPENDIX I—PROTECTIVE GLOVES INDEX AND DATA SHEETS

APPENDIX I—PROTECTIVE GLOVES INDEX AND DATA SHEETS

ID#	Item	Model	Manufacturer	Page I-#
1	Ansell Unsupported Neoprene Glove	29-865, 29-845	Ansell Healthcare	I-1
2	AirBoss Molded Glove	AMG	AirBoss Engineering Products, Inc.	I-3
3	Best Nitril Solve Glove	737, 747	Best Manufacturing Company	I-5
4	Best Neoprene Chloroflex II Glove	1823, 723, N8	Best Manufacturing Company	I-7
5	North Butyl Glove	B254GI, B074GI, B224GI	North Safety Products	I-9
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GENERAL

Ansell Unsupported Neoprene Glove

Model: 29-865, 29-845

Ansell Healthcare
 200 Schulz Drive
 Red Bank, New Jersey 07701
 Jamie Ashworth
 800-800-0444(Tel)
 585-223-2887 (Tel)
 800-800-0445 (Fax)
 jashworth@ansell.com

<http://www.ansellpro.com>
 RKB

Unit Cost: \$5.30



OSHA EPA Level: Class 3/Level B

Certification Status: NFPA 1994 Class 3 with Tychem® CPF3 (DuPont)
 NFPA 1994 Class 3 with Zytron 300® (Kappler)

NFPA Comments: Not specified

Availability: In stock, minimum order required. Minimum quantity—1 case (144 pair); average lead time is 5 business d to 7 business d from date of order.

Other Certifications: No third-party certifications in RKB for this product

Independent Testing: No third-party certifications in RKB for this product

Test Conducted: No third-party certifications in RKB for this product

Test Dates: No third-party certifications in RKB for this product

Material Technology: Neoprene gloves offer broad-spectrum protection, with excellent resistance to a wide range of chemicals, including oils, acids, caustics, and solvents. The gloves are case hardened to increase chemical and abrasion resistance over ordinary neoprene gloves.

Glove Description: The gloves is an 18 mil, 33 cm (13 in) soft cotton-lined Neoprene rubber glove with an embossed grip and a straight cuff. Neoprene gloves offer broad-spectrum protection, with excellent resistance to a wide range of chemicals, including oils, acids, caustics, and solvents. The gloves are case hardened to increase chemical and abrasion resistance over ordinary neoprene gloves.

Glove Application: Submersion in water or any other type of liquid(s). Applications are petrochemicals, degreasing, electronics, refining, handling oils, acids, caustics, alcohols, and solvents.

Flame Resistance: Not flame resistant

EOD Capability: Not specified

CAPABILITIES

CAs Protected Against: Not specified

BAs Protected Against: Not specified

TIMs Protected Against: See chemical duration results

Duration of Protection: These are ratings for NEOPRENE. Results are from the 7th Edition of the Ansell Chemical Resistance Guide.

Acetone cyanohydrin—10 min—F—ASTM F 739

Allyl alcohol—140 min—VG—ASTM F 739

Allylamine—not recommended—ASTM 739

Ammonia—gas—>480 min—ASTM 739

Carbon disulfide—Not recommended—ASTM 739

Formaldehyde (37 %)—105 min—Good—ASTM 739

Hydrogen cyanide—Gas—>480 min—excellent—ASTM 739

Nitric acid, fuming—NR—ASTM 739

Sulfuric acid, concentrated—95 %—21 min—ASTM 739

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Glove has been tested. Historical average—133 g (4.69 oz).
- **Puncture Resistance (ASTM F 1342):** Glove has not been tested. Measured result to puncture resistance test EN 388 (ANSI/ISEA 105-2000)—historical average 29.4 N (6.6 lbf).
- **Abrasion Resistance (ASTM D 3883):** Glove has not been tested. Historical Average at 500 g (17.64 oz) weight load—4860 rev; historical average at 1000 g (35.27 oz) weight load—2000 rev.
- **Resistance (Other):** The gloves are case hardened to increase chemical and abrasion resistance over ordinary neoprene gloves. Excellent resistance to a wide range of chemicals.
- **Environmental Conditions (ASTM D 747):** Glove has not been tested
- **Independent Cold Temperature Testing:** Glove has not been tested

HUMAN FACTORS

Grip Texture: Glove has an embossed grip pattern on the palm side of the glove to facilitate grip both wet and dry

Comfort (ASTM F 1154): Not tested

Dexterity (ASTM F 2010): Not tested

Thickness: 457 μ (18 mil) measured on back of glove opposite palm

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove can easily be turned inside out when pulled off for easy disposal. Glove can be worn directly over skin.

Ease of Entry: A liner is not available that conforms to the shape of the glove

Gauntlet Length: Glove gauntlet length is approximately 10 cm (4 in) beyond the wrist crease. The wrist crease is usually 23 cm (9 in), about the length of a disposable glove

Glove Length: 33 cm (13 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit; interface must be taped

LOGISTICS

TDP (Technical Data Package): Technical Data Package available. Contact Ansell Customer Service.

Shelf Life:

- **Shelf Life (Packaged):** 1 yr to 5 yr based upon general knowledge of the polychloroprene polymer
- **Shelf Life (Out of Package):** 9 mo to 1 yr. UV light, even from the small amount from fluorescent lighting can degrade the glove polymer over time.

Storage Conditions: <32 °C (<90 °F); low to moderate % rh

Sizes Available: X-small, small, medium, large, X-large, and XX-large (6, 7, 8, 9, 10, and 11)

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** No allergens
- **MSDS:** MSDS is not available. Gloves are exempt from MSDS requirements.

Warranty: Ansell products are guaranteed against defect in workmanship or material and will be replaced or credited if returned for examination. Not guaranteed against deterioration caused by wear, age, abuse, accident, strong solvents, or lengthy exposure to direct ultraviolet light. Returned goods will not be accepted without approval by Ansell customer service or a sales representative. Items returned within 12 mo of original shipment will be credited to a billing price less 15 % restocking charge. Items returned from 12 mo to 24 mo of the original shipment will be credited at billing price less 30 % stocking charge. No items may be returned after 24 mo.

GENERAL

AirBoss Molded Glove

Model: AMG

AirBoss Engineering Products, Inc.
881 Landry
Acton Vale, Quebec
J0H 1A0
Genevieve Lecours
450-546-2776 ext. 337 (Tel)
450-546-3735 (Fax)
Genevieve.lecours@airboss-acton.com

<http://www.airboss-acton.com>



OSHA EPA Level: Class 1/Level A

Unit Cost: The AMG costs from \$20 to \$30, depending of the choice of liners (cotton, Coolmax, Nomex, or X-Static), the packaging, and the quantity

Certification Status: Planned for submission to NFPA 1994, 2005 Edition, Class 3 certification by UL

NFPA Comments: Not specified

Availability: In stock

Other Certifications: The AMG is certified by Satra as compliant to the EC, Article 10 of the Personal Protective Equipment Directive (89/686/EEC)

Independent Testing: Battelle, Geomet, DRDC Suffield, DSTL Porton Down, Akron Rubber

Test Conducted: CAs TOP 8-2-501, QSTAG 991, Def Stan 93-55, Vapro Mist test with JSLIST ensemble, Permeation Resistance ASTM F739

Test Dates: While the AMG is in production, each production lot is required to be tested to CAs. The Vapro Mist test was conducted March 2001. The AMG was also tested against TICs in 2003 by Akron Rubber.

Material Technology: The AMG is an injection-molded butyl rubber glove. The butyl rubber is well known for its CA resistance. A new flame-resistant version of the AMG has also been developed. The AMG can be used in conjunction with its glove liner. This liner is available through several material combinations to offer different properties:

- 100 % cotton for moisture absorption
- Coolmax-Lycra-Viscose to remove moisture away from the skin
- Nomex for flame resistance
- X-Static for antimicrobial, anti-odor, and moisture transfer

Glove Description: The AMG has been ergonomically designed to provide correct finger and hand dimensions as well as a tighter wrist to keep the glove firmly on the hand. It is an ambidextrous glove that fits perfectly on both hands. It offers a better fit, feel, and physical properties than current dipped gloves. Its rounded, textured fingertips facilitate the manipulation of small items (ammunition, keyboard use). The textured fingertips and palm provide an improved grip. The AMG also has corrugations on the fingers and palm to ease flexibility and improve dexterity.

Glove Application: Flammable or flash fire environment; submersion in water or any other type of liquid(s); explosive atmospheres; radiation; and biologicals

Flame Resistance: The standard AMG compound is not flame resistant, but there is a new version of the AMG that is flame resistant (AMG FR), tested by Govmark per ASTM D6413 in March 2005 with an afterflame of 0.2 s and a char length of 1.75 in. The AMG FR is also meeting all chemical and physical properties of the regular AMG.

EOD Capability: The AMG is antistatic, certified by Satra per EN 1149-1

References: Canadian DND 145 000 units for 4 yr in use; Lantor UK 19 000 units for 2 yr in use; U.S. Navy 19 800 units for 2 yr in use; and USMC 240 000 units for 1 yr in use

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 1 CA permeation resistance (100 g/m²). Both NFPA 1991 and 1994 standards require 1 h protection against CAs. The AMG offers more than 24 h protection against CAs when tested by TOP 8-2-501 procedure.

BAs Protected Against: NFPA 1991/NFPA 1994 liquid penetration protection. Both NFPA 1991 and 1994 standards require 1 h protection against BAs. The AMG offers more than 24 h protection to aerosol particles when tested in the VAPRO Mist test chamber in conjunction with the JSLIST ensemble.

TIMs Protected Against: More than 60 min of protection when tested in accordance of ASTM F739 against the following TIMs: acetone, ethyl acetate, methanol, sodium hydroxide, sulfuric acid, ammonia gas, butadiene gas, and chlorine gas

Duration of Protection: 24 h against CA. Mission duration of 6 h for NFPA 1994, Class 3 requirements.

Acetone cyanohydrin—>480 min before penetration—EN 374

Ammonia—>480 min before penetration—EN 374

Arsine—>480 min before penetration

Chlorine—no breakthrough time—ASTM F 739

Ethylene oxide—>120 min before penetration

Fluorine—>60 min before penetration

Formaldehyde (37 %)—>480 min before penetration

Hydrogen bromide—>480 min before penetration

Hydrogen chloride—>480 min before penetration

Hydrogen cyanide—>480 min before penetration

Hydrogen sulfide—>480 min before penetration

Nitric acid, fuming—>60 min before penetration

Sulfur dioxide—>120 min before penetration

Sulfuric acid, concentrated (96 %)—no breakthrough time after 480 min—ASTM F 739

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Glove has been tested. Glove meets NFPA 1994, Class 2.
- **Puncture Resistance (ASTM F 1342):** The AMG is certified Level 1 as EN 388:1994 for puncture resistance
- **Abrasion Resistance (ASTM D 3883):** Glove has not been tested. The AMG is certified Level 2 as EN 388:1994 for abrasion resistance.
- **Resistance (Other):** Material is antistatic
- **Environmental Conditions (ASTM D 747):** Glove has not been tested
- **Independent Cold Temperature Testing:** The AMG has been tested for stiffening at low temperature (ASTM D1053) and maintain flexion angle (166 °) at 35 °C (95 °F)

HUMAN FACTORS

Grip Texture: The AMG has wet/dry grip capacity. It is designed with round butted fingertips and with a textured finish on fingertips and the palm to facilitate the manipulation of small items.

Comfort (ASTM F 1154): The AMG has been certified by Satra in accordance with EN 420:1994, Clause 5.1 for proper comfort and fit

Dexterity (ASTM F 2010): The AMG has been certified Class 5 by Satra in accordance with EN 420:1994, Clause 5.2 for dexterity

Thickness: 559 μ (22 mil) measured on the cuff and the palm

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove can easily be turned inside out when pulled off for easy disposal. Glove can be worn directly over skin.

Ease of Entry: A liner is available that conforms to the shape of the glove

Gauntlet Length: 15 cm (6 in) gauntlet length.

Glove Length: 34.29 cm (13.5 in) glove length

Glove/Suit Interface: No interface between the suit and glove

LOGISTICS

TDP (Technical Data Package): Not available

Shelf Life:

- **Shelf Life (Packaged):** 11 yr to 15 yr. The AMG is packaged with the same method using the same packaging material as the AirBoss Lightweight Overboot (ALO). The ALO has been manufactured for over 15 yr and samples are still in archives and tested periodically to check physical properties and chemical resistance.
- **Shelf Life (Out of Package):** 9 mo to 1 yr. The AMG is packaged with the same method using the same packaging material as the AirBoss Lightweight Overboot (ALO). The ALO has been manufactured for over 15 yr and samples are still in archives and tested periodically to check physical properties and chemical resistance.

Storage Conditions: -32 °C to 52 °C (-25 °F to 125 °F) without direct sunlight exposure; 30 % to 80 % rh

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large

The AMG is offered in seven different sizes: small, medium narrow, medium, large narrow, large, X-large narrow, and X-large. USMC is only purchasing sizes small, medium, large, and X-large.

Health Hazards and Safety: No latex and no allergens. MSDS is available.

Warranty: The AMG is guaranteed for 12 mo against material and manufacturing defects after delivery

GENERAL

Best Nitri-Solve Glove**Model:** 737, 747

Best Manufacturing Company
579 Edison Street
Menlo, Georgia 30731
Don Groce
706-862-2302 (Tel)
706-862-2660 (Fax)
dgroce@bestglove.com

<http://www.bestglove.com>
RKB

Unit Cost: \$5.30**OSHA EPA Level:** Class 3/Level B**Certification Status:** NFPA 1992 (2005 Edition) as stand-alone glove**NFPA Comments:** July 7, 2005—UL# MH 30026**Availability:** In stock**Other Certifications:** Not specified**Independent Testing:** SATRA Quality Assurance, Ltd.**Test Conducted:** EN 420, EN 388, EN 420, EN 374-2, EN 374-3**Test Dates:** November 25, 2004 and December 17, 2004

Material Technology: Nitri-Solve gloves are made from 100 % nitrile, which provides excellent protection from numerous chemicals by splash or total immersion. The gloves do not include an interface but fit readily onto suit sleeves with the proper clamps.

Glove Description: Best Nitri-Solve gloves have a cotton-flock lining and a bisque textured grip. They come packed a dozen pairs per bag. Nitri-Solve gloves work very well in aliphatic hydrocarbons, fuels, and perchloroethylene.

Several different styles are available including:

Nitri-Solve 737, 100 % 22 mil thick Nitrile—38 cm (15 in) long

Nitri-Solve 747, 100 % 22 mil thick Nitrile—48 cm (19 in) long

Glove Application: Submersion in water or any other type of liquid(s) and biological. Fuels, diesel, gasoline, jet fuel, kerosene, oils, and petroleum hydrocarbons.

Flame Resistance: Not flame resistant**EOD Capability:** Not EOD compatible

CAPABILITIES

CAs Protected Against: Not specified**BAs Protected Against:** Not specified

TIMs Protected Against: Meets 1994, 1991, and 1992 plus limited vapor (suit test); see information published on www.chemrest.com.

Duration of Protection: Protection based on mid-range within this product line

Acrylonitrile—1100 %—Not Recommended—NR—ASTM F 739

Ammonia—gas—336 min breakthrough—0.6 permeation rate—ASTM F 739

Carbon disulfide—gas—Not Recommended—NR—ASTM F739

Chlorine—gas—>480 min breakthrough—NR—ASTM F739

Ethylene oxide—gas—17 min breakthrough—500 permeation rate—ASTM F739

Formaldehyde (37 %)—37 %—>480 min breakthrough—ND—ASTM F739

Hydrogen chloride—gas—433 min breakthrough—0.64 permeation rate—ASTM F739

Hydrogen fluoride—gas—1 min breakthrough—1343 permeation rate—ASTM F739

Sulfuric acid, concentrated—97 %—180 min breakthrough—48 permeation rate—ASTM F739

Physical Resistance and Durability:

- Cut Resistance (ASTM F 1790):** The glove has not been tested

- **Puncture Resistance (ASTM F 1342):** Testing is pending
- **Abrasion Resistance (ASTM D 3883):** Testing is pending
- **Resistance (Other):** The material does not degrade when exposed to petroleum, oil, and lubricants
- **Environmental Conditions (ASTM D 747):** The glove has not been tested
- **Independent Cold Temperature Testing:** The glove has not been tested

HUMAN FACTORS

Grip Texture: Wet/dry grip

Comfort (ASTM F 1154): Pending

Dexterity (ASTM F 2010): Not specified

Thickness: Nitri-Solve 737—559 μ (22 mil); Nitri-Solve 747—559 μ (22 mil)

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove must be taped.

Ease of Entry: Not specified

Gauntlet Length: Nitri-Solve 717, 727, 730, 737—13.26 cm (5.22 in)

Glove Length: Nitri-Solve 717, 727, 730—33 cm (13 in); Nitri-Solve 737—38 cm (15 in); Nitri-Solve 717—48.26 cm (19 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit. Interface must be taped.

LOGISTICS

TDP (Technical Data Package): Contact dgroce@bestglove.com

Shelf Life:

- **Shelf Life (Packaged):** 6 yr to 10 yr based on historical testing of product that was that age
- **Shelf Life (Out of Package):** 3 mo to 6 mo based on history of the product and its characteristics

Storage Conditions: -18 °C to 25 °C (0 °F to 77 °F)

Sizes Available: X-small, small, medium, large, X-large, and XX-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** Rubber accelerators (Benzothiazoles and carbamates)
- **MSDS:** MSDS for ingredients, not for the finished goods

Warranty: 1 yr after shipment—free of defects in materials and workmanship at the time of manufacture. Replacement or refund.

GENERAL

Best Neoprene Chloroflex II Glove

Model: 1823, 723, N8

Best Manufacturing Company
579 Edison Street
Menlo, Georgia 30731
Don Groce
706-862-2302 (Tel)
706-862-2660 (Fax)
dgroce@bestglove.com

<http://www.bestglove.com>

Unit Cost: \$12.70



OSHA EPA Level: Class 1/Level A

Certification Status: NFPA 1992 (2005 Edition) as stand-alone glove

NFPA Comments: July 7, 2005—UL# MH 30026

Availability: In stock

Other Certifications: NFPA 1999, 2003; cleaning glove expected April 25, 2005

Independent Testing: SATRA Quality Assurance, Ltd.

Test Conducted: EN 420, EN 388, EN 420, EN 374-2, EN 374-3

Test Dates: November 25, 2004 and December 17, 2004

Material Technology: Chloroflex gloves are made from 100 % polychloroprene, which provides excellent protection from numerous chemicals by splash or total immersion. The gloves do not include an interface, but fit readily onto suit sleeves with the proper clamps.

Glove Description: Neoprene Chloroflex 1823, 100 % 20 mil thick Neoprene, 33 cm (13 in) long

Neoprene Chloroflex 723, 100 % 28 mil thick Neoprene, 30 cm (12 in) long

Neoprene Chloroflex N8, 100 % 30 mil thick Neoprene, 46 cm (18 in) long

Glove Application: Submersion in water or any other type of liquid(s); biological; and fuels, acids, and caustics

Flame Resistance: Not flame resistant

EOD Capability: Not EOD compatible

CAPABILITIES

CAs Protected Against: Not specified

BAs Protected Against: Not specified

TIMs Protected Against: Meets NFPA 1994 Class 1 liquid/gases permeation requirements; see information published on www.chemrest.com

Duration of Protection: Not specified

Acrylonitrile—100 %—18 min—32 permeation rate—ASTM F 739

Formaldehyde (37 %)—37 %—>480 min—ND—ASTM F739

Sulfuric acid, concentrated—97 %—>480 min—ND—ASTM F739

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Glove has not been tested
- **Puncture Resistance (ASTM F 1342):** Results are pending
- **Abrasion Resistance (ASTM D 3883):** Results are pending
- **Resistance (Other):** The material does not degrade when exposed to petroleum, oil, and lubricants
- **Environmental Conditions (ASTM D 747):** Glove has not been tested
- **Independent Cold Temperature Testing:** Glove has not been tested

HUMAN FACTORS

Grip Texture: Wet/dry grip

Comfort (ASTM F 1154): Pending

Dexterity (ASTM F 2010): Not specified

Thickness: Neoprene Chloroflex 1823—508 μ (20 mil); Neoprene Chloroflex 723—711 μ (28 mil); Neoprene Chloroflex N8—762 μ (30 mil)

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove must be taped.

Ease of Entry: Not specified

Gauntlet Length: 1823—13.26 cm (5.22 in); 723—10.72 cm (4.22 in); N8—25.96 cm (10.22 in)

Glove Length: 1823—33 cm (13 in); 723—30.48 cm (12 in); N8—45.72 cm (18 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit. Interface must be taped

LOGISTICS

TDP (Technical Data Package): Technical Data Package available. Contact dgroce@bestglove.com.

Shelf Life:

- **Shelf Life (Packaged):** 6 yr to 10 yr based on historical testing of product that was that age
- **Shelf Life (Out of Package):** 3 mo to 6 mo based on history of the product and its characteristics

Storage Conditions: -18 °C to 25 °C (0 °F to 77 °F)

Sizes Available: X-small, small, medium, large, X-large, and XX-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** Rubber accelerators (guanidines, benzothiazoles, and carbamates)
- **MSDS:** MSDS for ingredients, not for the finished goods

Warranty: 1 yr after shipment—free of defects in materials and workmanship at the time of manufacture. Replacement or refund.

GENERAL

North Butyl Glove**Model:** B254GI, B274GI, B224GI

North Safety Products
 2000 Plainfield Pike
 Cranston, Rhode Island 02921
 Alex Marks
 401-943-4400 (Tel)
 401-275-2618 (Fax)
 alex.marks@northsafety.com

http://www.northsafety.com
 RKB

**Unit Cost:** \$53**OSHA EPA Level:** Class 1/Level A**Certification Status:** No third-party certifications in RKB for this product**NFPA Comments:** Not specified**Availability:** In stock**Other Certifications:** ANSI/ISEA 105-2000**Independent Testing:** ASTM F739 Permeation Testing**Test Conducted:** Not specified**Test Dates:** Not specified**Material Technology:** Gloves are constructed from a nonpermeable butyl rubber film. Butyl gloves exhibit high permeation resistance to gas or water vapors. Ideal for use in ketones and esters.**Glove Description:** There are 5 models all 36 cm (14 in) long with various thickness: B254GI—25 mil and B224GI—22 mil**Glove Application:** Submersion in water or any other type of liquid(s); fused munitions; explosive atmospheres; biological; and deep frozen media**Flame Resistance:** Not flame resistant**EOD Capability:** EOD compatible

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 1 CA permeation resistance (100 g/m²). Test results are thickness dependent. North Butyl gloves regularly pass agent testing in accordance with MIL-STD-282 section 209 for HD and MIL-STD-282 section 208 for GB.

25 mil thick passes 360 min for HD and 450 min for GB

14 mil thick passes 210 min. for HD and 450 min for GB

7 mil thick passes 75 min for HD and 360 min for GB

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—Biological Threats)**TIMs Protected Against:** See chemical duration results**Duration of Protection:** 6 h

Acrylonitrile—100 %—>8 h—N/D—ASTM F739

Allylamine—100 %—3.9 h—7 mg/m²/s—ASTM F739Carbon disulfide—100 %—3 min—98.4 mg/m²/s—ASTM F739

Chloroacetonitrile—100 %—>8 h—N/D—ASTM F739

Ethylene dibromide—100 %—3.3 h—6.0 mg/m²/s—ASTM F739

Formaldehyde—37 %—>16 h—N/D—ASTM F739

Methyl isocyanate—100 %—1.1 h—9 mg/m²/s—ASTM F730**Physical Resistance and Durability:**

- **Cut Resistance (ASTM F 1790):** Not specified

- **Puncture Resistance (ASTM F 1342):** ANSI/ISEA 105—B254GI Level 2, B174 Level 2, B144GI Level 1, B224GI Level 2

- **Abrasion Resistance (ASTM D 3883):** ANSI/ISEA 105—B254GI Level 3, B174 Level 3, B144GI Level 3, B224GI Level 3
- **Resistance (Other):** The material degrades when exposed to petroleum, oil, and lubricants. Material is antistatic. Butyl gloves exhibit high permeation resistance to gas or water vapors. Ideal for use in ketones and esters.
- **Environmental Conditions (ASTM D 747):** Glove has not been tested
- **Independent Cold Temperature Testing:** North butyl gloves pass ASTM D1053 and Mil-DLT-43976D for cold flex

HUMAN FACTORS

Grip Texture: Wet/dry grip

Comfort (ASTM F 1154): Not tested

Dexterity (ASTM F 2010): Not specified

Thickness: Thickness measured on the back of hand: B254GI—635 μ (25 mil); B224GI—559 μ (22 mil)

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove can be worn directly over skin.

Ease of Entry: A liner is available that conforms to the shape of the glove

Gauntlet Length: 15.24 cm (6 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** 5 yr recommended based on history. Gloves should be visually inspected before use.
- **Shelf Life (Out of Package):** >1 yr based on history

Storage Conditions: 10 °C to 29 °C (50 °F to 85 °F); 20 % to 80 % rh

Sizes Available: X-small, small, medium, large, and X-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** No other allergens
- **MSDS:** MSDS is available

Warranty: Not specified

GENERAL

North Butyl/Neoprene Glove

Model: BNI243APM

North Safety Products
2000 Plainfield Pike
Cranston, Rhode Island 02921
Alex Marks
401-943-4400 (Tel)
401-275-2618 (Fax)
alex.marks@northsafety.com
www.northsafety.com

http://www.northsafety.com
RKB



Unit Cost: \$43

OSHA EPA Level: Class 1/Level A or Class 2

Certification Status: NFPA 1994 (2001 Edition) Class 1 with STEPO, Fully Encapsulating Coverall Ensemble (Saint-Gobain)

NFPA 1994 (2001 Edition) Class 2 with DTAPS (Geomet) (CBT GEO 01) July 14, 2004

NFPA Comments: CBT GEO 01—July 14, 2004

Availability: In stock

Other Certifications: ANSI/ISEA 105-2000

Independent Testing: ASTM F739 Permeation Testing

Test Conducted: Not specified

Test Dates: Not specified

Material Technology: Gloves are constructed from a nonpermeable butyl rubber film with an outer layer of neoprene rubber

Glove Description: The BNI243 is a 24 mil glove that has an 18 mil butyl inner layer, and a 6 mil neoprene outer layer.

Curved hand design for comfort. Smooth palm with rolled bead cuff. Available in sizes 8 to 11. Made in the U.S.A.

Glove Application: Flammable or flash fire environment; submersion in water or any other type of liquid(s); fused munitions; explosive atmospheres; biological; and deep frozen media. Butyl/neoprene composite protects hands against exposure to most chemicals in addition to petroleums, oils and lubricants (POL). This unique composite offers quality protection and extends the life of the glove.

Flame Resistance: Flame resistant

EOD Capability: EOD compatible

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 1 CA permeation resistance (100 g/m²). Tested and passed for resistance to CAs in accordance with the British MoD specification UK/SC/4985B.

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—Biological Threats)

TIMs Protected Against: Not specified

Duration of Protection: 6 h

Not specified

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Not specified
- **Puncture Resistance (ASTM F 1342):** Not specified
- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** The material does not degrade when exposed to petroleum, oil, and lubricants. Material is antistatic.
- **Environmental Conditions (ASTM D 747):** Glove has not been tested
- **Independent Cold Temperature Testing:** North butyl/neoprene gloves pass ASTM D1053 and Mil-DLT-43976D for cold flex

HUMAN FACTORS

Grip Texture: Not specified

Comfort (ASTM F 1154): Not tested

Dexterity (ASTM F 2010): Not specified

Thickness: 610 μ (24 mil) measured on the back of hand

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove can be worn directly over skin.

Ease of Entry: A liner is available that conforms to the shape of the glove

Gauntlet Length: 15.24 cm (6 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** 5 yr recommended based on history. Gloves should be visually inspected before use.
- **Shelf Life (Out of Package):** >1 yr based on history

Storage Conditions: 10 °C to 29 °C (50 °F to 85 °F); 20 % to 80 % rh

Sizes Available: X-small, small, medium, large, and X-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** No allergens
- **MSDS:** MSDS is available

Warranty: Not specified

GENERAL

North B254SSG Interlock Glove

Model: B254SSG

North Safety Products
 2000 Plainfield Pike
 Cranston, Rhode Island 02921
 Alex Marks
 401-943-4400 (Tel)
 401-275-2618 (Fax)
 alex.marks@northsafety.com
 www.northsafety.com

http://www.northsafety.com



OSHA EPA Level: Class 1/Level A

Unit Cost: \$55/pair

Certification Status: Not specified

NFPA Comments: Not specified

Availability: In stock

Other Certifications: ANSI/ISEA 105-2000

Independent Testing: ASTM F739 Permeation Testing

Test Conducted: Not specified

Test Dates: Not specified

Material Technology: Gloves are constructed from a nonpermeable butyl rubber film and a plastic film

Glove Description: SilverShield gloves are made from a 5 layer coextruded plastic film that offers excellent chemical resistance. The B254 glove is made from butyl rubber. These 2 gloves are sealed together, combining the best properties from both gloves.

Glove Application: Submersion in water or any other type of liquid(s); explosive atmospheres; biological; and liquefied gas conditions

Flame Resistance: Not flame resistant

EOD Capability: EOD compatible

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 1 CA permeation resistance (100 g/m²). North B254SSG Interlock gloves offer greater than 8 h protection from HD and GB.

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—Biological Threats)

TIMs Protected Against: See chemical duration results

Duration of Protection: 6 h

Acrolein—100 %—>8 h—ND—ASTM F 739

Acrylonitrile—100 %—>8 h—ND—ASTM F 739

Allylamine—100 %—3.9 h—7 mg/m²/s—ASTM F 739

Ammonia—100 %—36 min—0.33 mg/m²/s

Carbon disulfide—100 %—>24 h—ND—ASTM F 739

Chlorine—100 %—>8 h—ND—ASTM F 739

Chloroacetone—100 %—>8 h—ND—ASTM F 739

Ethylene oxide—100 %—>8 h—ND—ASTM F 739

Formaldehyde (37 %)—37 %—>16 h—ND—ASTM F 739

Hydrogen chloride—37 %—>8 h—ND—ASTM F 739

Hydrogen cyanide—100 %—>4 h—ND—ASTM F 739

Methyl isocyanate—100 %—>8 h—ND—ASTM F 739

Nitric acid, fuming—70 %—>6 h—9 mg/m²/s—ASTM F 739

Sulfuric acid, concentrated—93 %—>24 h—ND—ASTM F 739

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Glove has not been tested
- **Puncture Resistance (ASTM F 1342):** Level 2 per ANSI/ISEA 105c
- **Abrasion Resistance (ASTM D 3883):** Level 3 per ANSI/ISEA 105
- **Resistance (Other):** The material does not degrade when exposed to petroleum, oil, and lubricants
- **Environmental Conditions (ASTM D 747):** Glove has not been tested
- **Independent Cold Temperature Testing:** Glove has not been tested

HUMAN FACTORS

Grip Texture: Not specified

Comfort (ASTM F 1154): Not tested

Dexterity (ASTM F 2010): Not specified

Thickness: 610 μ (24 mil)

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove can be worn directly over skin.

Ease of Entry: A liner is available that conforms to the shape of the glove

Gauntlet Length: 15.24 cm (6 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: Not specified

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** 5 yr recommended based on history. Gloves should be visually inspected before use.
- **Shelf Life (Out of Package):** >1 yr based on history

Storage Conditions: 10 °C to 29 °C (50 °F to 85 °F); 20 % to 80 % rh

Sizes Available: Large and X-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** No allergens
- **MSDS:** MSDS is available

Warranty: Not specified

GENERAL

Chemical Protective Butyl Rubber Glove**Model:** CP-25, CP-25R

Guardian Manufacturing Company
 302 Conwell Avenue
 Willard, Ohio 44890-9525
 Gene E. Lamoreaux
 419-933-2711 (Tel)
 419-935-8961 (Fax)
 glamro@willard-oh.com

<http://www.guardian-mfg.com>
 RKB

**Unit Cost:** \$32.60—1 pair to 35 pair; \$30.97—>36 pair**OSHA EPA Level:** Class 1/Level A**Certification Status:** NFPA 1994 Class 1 with ensembles [Zytron 500 (Kappler)]**NFPA Comments:** Planned for NFPA 1994 stand-alone submission**Availability:** In stock, minimum order required. 4 wk for 1000 pair, smaller quantities available through distributors.**Other Certifications:** MIL-DTL-43976**Independent Testing:** No third-party certifications in RKB for this Product**Test Conducted:** No third-party certifications in RKB for this Product**Test Dates:** No third-party certifications in RKB for this Product**Material Technology:** Guardian gloves are solution-dipped, providing unparalleled protection for users. Tight molecular structures are the key to chemical impermeability. Microprocessors provide accurate controls every step of the way, from mixing our proprietary compounds, to dipping, curing and drying, in order to attain the necessary strength. Recommended for industrial, laboratory, first response, and chemical production use. Seamless rough-grip finish, gives increased dexterity and improved grip.**Glove Description:** Chemical protective butyl rubber glove designed to protect against CAs and various TICs and TIMs. The glove is designed with a smooth grip (CP-25) and roughened grip (CP-25R).**Glove Application:** Not specified**Flame Resistance:** Not flame resistant**EOD Capability:** Probably not EOD compatible**References:** Defense Supply Center Philadelphia—12 000 000 units for 22 yr in use

CAPABILITIES

CAs Protected Against: Mustard resistance 360 min; sarin resistance 450 min**BAs Protected Against:** Not specified**TIMs Protected Against:** Same chemical protection properties as standard line of butyl gloves. Acids, alkalis, MEK, MIBK, acetone, and others.**Duration of Protection:** 6 h

Ammonia (99 %)—ND breakthrough, NA permeation—ASTM 739

Carbon disulfide (99 %)—<4 min ND breakthrough—>500 permeation rate—ASTM 739

Chlorine (99 %)—30 min breakthrough—>50 permeation rate—ASTM 739

Hydrogen chloride (99 %)—ND breakthrough—NA permeation—ASTM 739

Hydrogen fluoride (99 %)—15 min breakthrough—>100 permeation rate—ASTM 739

Sulfuric acid, concentrated (93 %)—ND breakthrough—NA permeation—ASTM 739

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** 100 g (3.53 oz)
- **Puncture Resistance (ASTM F 1342):** Glove has not been tested
- **Abrasion Resistance (ASTM D 3883):** Glove has not been tested

- **Resistance (Other):** The material degrades when exposed to petroleum, oil, and lubricants
- **Environmental Conditions (ASTM D 747):** Glove has not been tested
- **Independent Cold Temperature Testing:** ASTM D 1053

HUMAN FACTORS

Grip Texture: Pumice overdip grip, rounded fingertips to facilitate the manipulation of small items, and wet/dry grip

Comfort (ASTM F 1154): Not specified

Dexterity (ASTM F 2010): Not specified

Thickness: 635 μ (25 mil) at the palm

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove can easily be turned inside out when pulled off for easy disposal. Glove can be worn directly over skin.

Ease of Entry: A liner is available that conforms to the shape of the glove

Gauntlet Length: 15.24 cm (6 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: Interface between the suit and glove. Gauntlet is compatible for interfacing with the suit.

LOGISTICS

TDP (Technical Data Package): Not available

Shelf Life:

- **Shelf Life (Packaged):** 6 yr to 10 yr. Gloves can be decontaminated with STB.
- **Shelf Life (Out of Package):** Not specified

Storage Conditions: -40 °C to 49 °C (-40 °F to 120 °F); <90 % rh

Sizes Available: X-small, small, medium, large, and X-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** Thiuram; thiazol
- **MSDS:** MSDS is available

Warranty: 5 yr—Guardian warrants each pair of its gloves to be free from defects in material and workmanship that would affect the performance or serviceability of the glove

GENERAL

Piercan Glove

Model: L 1330 B 6/10

Paul Boyé
 1564, Avenue de Lagardelle
 31810 Le Vernet, France
 Francis A. Brochu
 410-939-0816 (Tel)
 +33 5 34 48 21 11 (Tel)
 +33 5 34 48 21 09 (Fax)
 fbrochu@btgtechnologies.com

 http://paulboye.com



OSHA EPA Level: Class 3/Level B

Unit Cost: \$40

Certification Status: NFPA 1994 (2001 Edition) Class 3 with Paul Boyé Model CLD 420, Class 3 ensemble by Underwriters Laboratories, Inc.

NFPA Comments: Certified as required ensemble component NFPA 1994 Class 3 ensemble

Availability: Manufactured on demand

Other Certifications: CE Certification AFAQ, ISO 9000 2000 Version AFAQ

Independent Testing: Not specified

Test Conducted: Not specified

Test Dates: Not specified

Material Technology: Gloves are made with pure butyl, thickness 0.6 mm (24 mil). Gloves are made by the dipping process with a special formulation developed by Piercan, which gives the glove good dexterity and good impermeability to gas. The raw material (butyl) does not contain any plastifiant, unlike other manufacturing technology. The glove is made in one piece and does not have any junctions.

Glove Description: Shape is left and right. Raw material is butyl (polyisoprene isobutylène).

Glove Application: Fused munitions; explosive atmospheres; and biological. Suitable for CBRN applications (certified NFPA1994, Class 3).

Flame Resistance: Not flame resistant

EOD Capability: Not EOD compatible

References: Ministry of Defense—10 yr in use—G. Stevens 33-4-7663-69-00

KARSKE OY (FINLAND)—8 000 pairs—4 yr in use—Finland Defense (+358-9711-644)

BM POLYCO—Phil Vanes (+44-845-2411-038)

SELOCA (AIR FORCE)—500 000 pairs—15 yr in use

CAPABILITIES

CAs Protected Against: NFPA 1994, Class 1 CA permeation resistance (100 g/m²)

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—Biological Threats)

TIMs Protected Against: See chemical duration results

Duration of Protection: Not specified

Chemical Name—Concentration—Class following EN 374—Test Method*

Nitric acid—6—EN 374-3

Caustic soda—0—EN 374-3

Hydrogen peroxide 30 %—6—EN 374-3

Trichlorethan—3—EN 374-3

Alcohol 90 %—6—EN 374-3

Acetone—6—EN 374-3

Tributyophosphate—6—EN 374-3

Nitric acid, fuming—7697-37-2—3N—>480 min—EN 374

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** The glove is NFPA 1994 Class 3 certified. Result was >50.0 mm (1.97 in) with 60 g (2.12 oz) load.
- **Puncture Resistance (ASTM F 1342):** The glove is NFPA 1994 Class 3 certified. Result was 17.27 N (3.88 lbf).
- **Abrasion Resistance (ASTM D 3883):** Level 3 (EN 388 § 6.1)
- **Resistance (Other):** Performance with the following chemicals is excellent: Nitric acid, chlorhydric acid, ammonia, alcali, alcohol, ozone, free radicals, ketonic solvents, UV, and natural aging. Not recommended with the following: aliphatic solvents, aromatic solvents, chllore-based solvents, aliphatic oils, and aromatic oils. The material does not degrade when exposed to petroleum, oil, and lubricants.
- **Environmental Conditions (ASTM D 747):** The glove is compliant with NFPA 1994 Class 3 requirements. Result is <0.001 N•m (0.009 lbf•in)
- **Independent Cold Temperature Testing:** Not specified

HUMAN FACTORS

Grip Texture: The gloves is close-fitting and doesn't need any grip texture, which would lower the touch response (see dexterity)

Comfort (ASTM F 1154): Level 5 (EN 420 § 6.3)

Dexterity (ASTM F 2010): The average percent of bare-handed control was 109.5 % for small size and 108.1 % for large size

Thickness: 635 μ (25mil)

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove is integrated as part of the ensemble/garment and is removable (with instructions). Glove does not have to be taped. The glove is a detachable element of NFPA 1994 Class 3 ensemble. Special interface with Paul Boyé tactical suit, model CLD420 offers compliance with NFPA 1994 Class 3 requirements without taping the glove (see §3.7).

Ease of Entry: The glove has not been submitted yet to Class 1 or Class 2 certifications following NFPA 1994

Gauntlet Length: 11.99 cm (4.72 in)

Glove Length: Size 9.5—33 cm (13 in)

Glove/Suit Interface: Interface between the suit and glove; built-in interface for connecting glove to suit; gauntlet is compatible for interfacing with the suit. The interface between the glove and the Paul Boyé tactical suit CLD420 (NFPA1994, Class 3) is a built-in interface achieved by the special design of the CLD420 sleeves (double-cuff system).

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** Between 6 yr and 10 yr
- **Shelf Life (Out of Package):** 6 mo to 9 mo due to degradation of the mechanical properties

Storage Conditions: 4 °C to 24 °C (40 °F to 75 °F)

Sizes Available: X-small, small, medium, large, X-large, XX-large, and XXX-large. Seven sizes are available: 6.5, 7, 7.5, 8, 8.5, 9, and 9.5.

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** No allergens
- **MSDS:** MSDS not available

Warranty: Not specified

GENERAL**Butoeject Gloves****Model:** Paul Boyé

Paul Boyé
 1564 Route de Lagardelle
 31810 Le Vernet, France
 Francis A. Brochu
 410-939-0816 (Tel)
 +33 5 34 48 21 11 (Tel)
 +33 5 34 48 21 09 (Fax)
 fbrochu@btgtechnologies.com

<http://paulboye.com>

**OSHA EPA Level:** Class 1/Level A**Unit Cost:** Not specified**Certification Status:** Not specified**NFPA Comments:** Not specified**Other Certifications:** Not specified**Independent Testing:** Not specified**Test Conducted:** Not specified**Test Dates:** Not specified**Material Technology:** Not specified**Glove Description:** Not specified**Glove Application:** Not specified**Flame Resistance:** Not specified**EOD Capability:** Not specified**CAPABILITIES****CAs Protected Against:** NFPA 1994 Class 1 CA permeation resistance (100 g/m²)**BAs Protected Against:** Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—Biological Threats)**TIMs Protected Against:** Not specified**Duration of Protection:** Not specified

Not specified

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Not specified
- **Puncture Resistance (ASTM F 1342):** Not specified
- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** Not specified
- **Environmental Conditions (ASTM D 747):** Not specified
- **Independent Cold Temperature Testing:** Not specified

HUMAN FACTORS**Grip Texture:** Not specified**Comfort (ASTM F 1154):** Not specified**Dexterity (ASTM F 2010):** Not specified**Thickness:** Not specified**Don/Doff:** Not specified**Ease of Entry:** Not specified**Gauntlet Length:** Greater than 10 cm (4 in) above the wrist**Glove Length:** Not specified**Glove/Suit Interface:** Not specified**LOGISTICS****TDP (Technical Data Package):** Not specified**Shelf Life (Packaged):** Between 6 yr and 10 yr**Shelf Life (Out of Package):** Not specified**Storage Conditions:** Not specified**Sizes Available:** At least 5 sizes available**Health Hazards and Safety:**

- **Latex:** Not specified
- **Allergens:** Not specified

Warranty: Not specified**MSDS:** Not specified

GENERAL

Best Butyl Glove**Model:** 878

Best Manufacturing Company
 579 Edison Street
 Menlo, Georgia 30731
 Don Groce
 706-862-2302 (Tel)
 706-862-2660 (Fax)
 dgroce@bestglove.com

<http://www.bestglove.com>
 RKB

Unit Cost: \$30**OSHA EPA Level:** Class 1/Level A**Certification Status:** Submitted NFPA 1994 (2001 Edition), Underwriters Laboratories, Inc.**NFPA Comments:** Not specified**Availability:** In stock**Other Certifications:** ASTM F-739**Independent Testing:** No third-party certifications in RKB for this product**Test Conducted:** No third-party certifications in RKB for this product**Test Dates:** No third-party certifications in RKB for this product

Material Technology: Butyl gloves are made from 100 % butyl rubber which provides excellent protection from numerous chemicals by splash or total immersion. The gloves do not include an interface but fit readily onto suit sleeves with the proper clamps.

Glove Description: Several different styles are available including: Best Butyl 874, 100 % 14 mil thick butyl [36 cm (14 in long)]—Made in Germany. Chemical resistant to ketones, aldehydes, amines, amides, and gases. Resistant to many of the TIMs from soft targets. Very soft and pliable and good-fitting from ergonomic design features.

Best Butyl 874R, 100 % 14 mil thick butyl [36 cm (14 in long, rough textured grip)]—A rough textured medium-weight butyl glove that is designed for superior chemical protection and excellent dexterity and touch sensitivity. The gloves protect from CAs, TIMs, gases, ketones, and other chemicals. They have exceptional dexterity and touch sensitivity. Made in Germany.

These gloves are excellent replacement parts for first responder suits.

Best Butyl 878, 100 % 30 mil thick butyl [36 cm (14 in long)]—butyl glove, heavy-weight, designed for WMD. Designed for protection from the most hazardous chemicals including CAs and TIMs. Fits chemical-resistant suit cuffs. Made in Germany.

Glove Application: Submersion in water or any other type of liquid(s), CB agents

Flame Resistance: Not flame resistant

EOD Capability: Not EOD compatible

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 1 CA permeation resistance (100 g/m²)

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—Biological Threats)

TIMs Protected Against: See information published on www.chemrest.com

Duration of Protection: Not specified

Not specified

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** The glove has not been tested
- **Puncture Resistance (ASTM F 1342):** Testing is pending
- **Abrasion Resistance (ASTM D 3883):** Testing is pending
- **Resistance (Other):** The material does not degrade when exposed to petroleum, oil, and lubricants
- **Environmental Conditions (ASTM D 747):** The glove has not been tested
- **Independent Cold Temperature Testing:** The glove has not been tested

HUMAN FACTORS

Grip Texture: Pumice overdip grip and wet/dry grip

Comfort (ASTM F 1154): Pending

Dexterity (ASTM F 2010): Not specified

Thickness: Best Butyl 878—762 μ (30 mil)

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed.

Ease of Entry: Not specified

Gauntlet Length: Best Butyl 874, 874R, 878—15.8 cm (6.22 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit. Interface must be taped.

LOGISTICS

TDP (Technical Data Package): Contact dgroce@bestglove.com

Shelf Life:

- **Shelf Life (Packaged):** 6 yr to 10 yr based on historical testing of product that was that age
- **Shelf Life (Out of Package):** 3 mo to 6 mo based on history of the product and its characteristics

Storage Conditions: -18 °C to 25 °C (0 °F to 77 °F)

Sizes Available: X-small, small, medium, large, X-large, and XX-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** Rubber accelerators
- **MSDS:** MSDS for ingredients, not for the finished goods

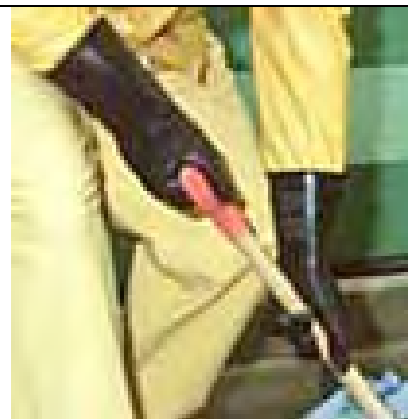
Warranty: 1 yr after shipment—free of defects in materials and workmanship at the time of manufacture. Replacement or refund.

GENERAL

Chemical Protective Neoprene Rubber Glove**Model:** IN-35, IN-35A

Guardian Manufacturing Company
 302 Conwell Avenue
 Willard, Ohio 44890-9525
 Gene E. Lamoreaux
 419-933-2711 (Tel)
 419-935-8961 (Fax)
 glamro@willard-oh.com

<http://www.guardian-mfg.com>
 RKB

**OSHA EPA Level:** Class 1/Level A**Unit Cost:** \$35.92—1 pair to 35 pair; \$34.12—>36 pair

Certification Status: NFPA 1994 Class 1 with Tychem® Responder (DuPont)
 NFPA 1994 Class 1 with Tychem® TK (DuPont)
 NFPA 1994 Class 1 with Trelchem® VPS VP1/-V (Trelleborg)
 NFPA 1991 (2005 Edition) with Commander® EX Brigade (Tychem® TK) (DuPont)
 NFPA 1991 (2005 Edition) with Tychem® Responder (DuPont)
 NFPA 1991 (2005 Edition) with Trelchem® HPS VP1/-V (Trelleborg)
 NFPA 1991 (2005 Edition) with Trelchem® VPS VP1/-V (Trelleborg)

NFPA Comments: Not specified

Availability: In stock, minimum order required. 4 wk for 1000 pair, smaller quantities available through distributors.

Other Certifications: MIL-DTL-32066**Independent Testing:** No third-party certifications in RKB for this Product**Test Conducted:** No third-party certifications in RKB for this Product**Test Dates:** No third-party certifications in RKB for this Product

Material Technology: Guardian gloves are solution-dipped, providing unparalleled protection for their users. Tight molecular structures are the key to chemical impermeability. Our state-of-the-art microprocessors provide accurate controls every step of the way, from mixing our proprietary compounds, to dipping, curing and drying, in order to attain the necessary strength. A flame-resistant glove—ideal when properly worn as part of the glove system with the complete vapor protective garment ensemble. Provides chemical protection and resist deterioration from contact with petroleum products.

Glove Description: Available in 35 mil, smooth finish only**Glove Application:** Not specified**Flame Resistance:** Not specified**EOD Capability:** Not specified

CAPABILITIES

CAs Protected Against: Not specified**BAs Protected Against:** Not specified**TIMs Protected Against:** Chemical protective Neoprene rubber glove designed to protect against various TIMs**Duration of Protection:** 1 h

Acetone cyanohydrin—49 min breakthrough—>500 permeation rate—EN 739

Acrylonitrile—120 min breakthrough—9.53 permeation rate—EN 739

Ammonia—ND breakthrough—NA permeation—ASTM 739

Carbon disulfide—4 min breakthrough—>500 permeation rate—EN 739

Chlorine—120 min breakthrough—>50 permeation rate—EN 739

Ethylene oxide—40 min breakthrough—>500 permeation rate—EN 739

Hydrogen chloride—ND breakthrough—NA permeation rate—ASTM 739

Hydrogen fluoride—300 min breakthrough—4.4 permeation rate—EN 739

Sulfuric acid, concentrated (96 %)—ND breakthrough—NA permeation rate—ASTM 739

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** 220 g (7.76 oz)
- **Puncture Resistance (ASTM F 1342):** Glove has not been tested
- **Abrasion Resistance (ASTM D 3883):** Glove has been tested
- **Resistance (Other):** The material does not degrade when exposed to petroleum, oil, and lubricants
- **Environmental Conditions (ASTM D 747):** Glove has not been tested
- **Independent Cold Temperature Testing:** Glove has not been tested

HUMAN FACTORS

Grip Texture: Rounded fingertips to facilitate the manipulation of small items and wet/dry grip

Comfort (ASTM F 1154): Not tested

Dexterity (ASTM F 2010): Not specified

Thickness: 889 μ (35 mil) at the palm

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove can be worn directly over skin.

Ease of Entry: Not specified

Gauntlet Length: 15.24 cm (6 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: No interface between the suit and glove

LOGISTICS

TDP (Technical Data Package): Not available

Shelf Life:

- **Shelf Life (Packaged):** 5 yr
- **Shelf Life (Out of Package):** Not specified

Storage Conditions: -40 °C to 49 °C (-40 °F to 120 °F); <90 % rh

Sizes Available: Small, medium, large, and X-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** Not specified
- **MSDS:** MSDS is available

Warranty: 5 yr—Guardian warrants each pair of its gloves to be free from defects in material and workmanship that would affect the performance or serviceability of the glove

GENERAL**Standard X-Heavy Butyl Glove****Model:** IB-35

Guardian Manufacturing Company
 302 Conwell Avenue
 Willard, Ohio 44890-9525
 Gene E. Lamoreaux
 419-933-2711 (Tel)
 419-935-8961 (Fax)
 glamro@willard-oh.com



<http://www.guardian-mfg.com>

Unit Cost: \$41.55—1 pair to 35 pair; \$39.48—>36 pair

OSHA EPA Level: Class 1/Level A

Certification Status: Planned for submission

NFPA Comments: Not specified

Availability: Manufactured on demand. 4 wk for 1000 pair, smaller quantities available through distributors.

Other Certifications: Not specified

Independent Testing: Not specified

Test Conducted: Not specified

Test Dates: Not specified

Material Technology: Constructed of an impermeable 35 mil butyl chemical resistant polymer

Glove Description: A heavier version of the standard butyl for additional protection; straight-hand design; smooth finish only

Glove Application: Chemical protective butyl rubber glove is designed to protect against CAs and various TICs and TIMs

Flame Resistance: Not specified

EOD Capability: Probably not EOD compatible

CAPABILITIES

CAs Protected Against: Not specified

BAs Protected Against: Not specified

TIMs Protected Against: See chemical duration results

Duration of Protection: 6 h

Ammonia—no breakthrough in 8 h—NA—ASTM F739

Carbon disulfide—<4—>500—ASTM F739

Chlorine—60 min—>50—ASTM F739

Ethylene oxide—173 min—3.53—ASTM F739

Hydrogen chloride—no breakthrough in 8 h—NA—ASTM F739

Hydrogen fluoride—15—>100—ASTM F739

Sulfuric acid, concentrated—no breakthrough in 8 h—NA—ASTM F739

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Glove has been tested
- **Puncture Resistance (ASTM F 1342):** Glove has not been tested
- **Abrasion Resistance (ASTM D 3883):** Glove has not been tested
- **Resistance (Other):** The material degrades when exposed to petroleum, oil, and lubricants
- **Environmental Conditions (ASTM D 747):** Glove has not been tested
- **Independent Cold Temperature Testing:** ASTM D 1053

HUMAN FACTORS

Grip Texture: Not specified

Comfort (ASTM F 1154): Not specified

Dexterity (ASTM F 2010): Not specified

Thickness: 889 μ (35 mil) when measured at the palm of the glove

Don/Doff: 0 s to 30 s to don/doff

Ease of Entry: A liner is available that conforms to the shape of the glove

Gauntlet Length: 15.24 cm (6 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit

LOGISTICS

TDP (Technical Data Package): Not available

Shelf Life:

- **Shelf Life (Packaged):** 5 yr
- **Shelf Life (Out of Package):** Not specified

Storage Conditions: -40 °C to 49 °C (-40 °F to 120 °F)

Sizes Available: Available in sizes 10, 11, and 12

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** Thiuram; thiazol
- **MSDS:** MSDS is available

Warranty: 5 yr—Guardian warrants each pair of its gloves to be free from defects in material and workmanship that would affect the performance or serviceability of the glove

GENERAL**Viton Heavy-Weight Glove****Model:** 890, 892

Best Manufacturing Company
 579 Edison Street
 Menlo, Georgia 30731
 Don Groce
 706-862-2302 (Tel)
 706-862-2660 (Fax)
 dgroce@bestglove.com

<http://www.bestglove.com>
 RKB

**OSHA EPA Level:** Class 1/Level A**Unit Cost:** \$199**Certification Status:** Submitted NFPA 1994 (2001 Edition), Underwriters Laboratories, Inc.**NFPA Comments:** Not specified**Availability:** In stock**Other Certifications:** No third-party certifications in RKB for this product**Independent Testing:** No third-party certifications in RKB for this product**Test Conducted:** No third-party certifications in RKB for this product**Test Dates:** No third-party certifications in RKB for this product

Material Technology: Viton gloves are made from Viton over butyl rubber, which provides excellent protection from numerous chemicals by splash or total immersion. The gloves do not include an interface but fit readily onto suit sleeves with the proper clamps.

Glove Description: Best Viton Heavyweight 30 mil thick, 36 cm (14 in) long gloves offer the ultimate protection from exposure to aromatic compounds and most halogenated hydrocarbons. Viton is resistant to all petroleum hydrocarbons including aromatics.

Glove Application: Submersion in water or any other type of liquid(s); biological; and CAs

Flame Resistance: Not flame resistant

EOD Capability: Not EOD compatible

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 1 CA permeation resistance (100 g/m²); also NFPA 1994, Class 2 CA permeation resistance (10 g/m², closed top)

BAs Protected Against: Not specified

TIMs Protected Against: Not specified

Duration of Protection: Not specified

Not specified

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Glove has not been tested
- **Puncture Resistance (ASTM F 1342):** Results are pending
- **Abrasion Resistance (ASTM D 3883):** Results are pending
- **Resistance (Other):** The material does not degrade when exposed to petroleum, oil, and lubricants
- **Environmental Conditions (ASTM D 747):** Glove has not been tested
- **Independent Cold Temperature Testing:** Glove has not been tested

HUMAN FACTORS

Grip Texture: Not specified

Comfort (ASTM F 1154): Pending

Dexterity (ASTM F 2010): Not tested

Thickness: 890—991 μ (39 mil); 892—12 mil

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove must be taped.

Ease of Entry: Not specified

Gauntlet Length: 15.8 cm (6.22 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: Interface must be taped. Gauntlet is compatible for interfacing with the suit.

LOGISTICS

TDP (Technical Data Package): Technical Data Package available. Contact dgroce@bestglove.com.

Shelf Life:

- **Shelf Life (Packaged):** 6 yr to 10 yr based on the history of the product and its characteristics
- **Shelf Life (Out of Package):** 3 mo to 6 mo based on history of the product and its characteristics

Storage Conditions: -18 °C to 25 °C (0 °F to 77 °F)

Sizes Available: Large and X-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** Rubber accelerators
- **MSDS:** MSDS for ingredients, not for the finished goods

Warranty: 1 yr after shipment—free of defects in materials and workmanship at the time of manufacture. Replacement or refund.

GENERAL**North Viton® Glove****Model:** F101

North Safety Products
 2000 Plainfield Pike
 Cranston, Rhode Island 02921
 Alex Marks
 401-943-4400 (Tel)
 401-275-2618 (Fax)
 alex.marks@northsafety.com

<http://www.northsafety.com>

**OSHA EPA Level:** Class 3/Level B**Unit Cost:** \$71**Certification Status:** Not specified**NFPA Comments:** Not specified**Availability:** In stock**Other Certifications:** Not specified**Independent Testing:** ASTM F739 Permeation Testing**Test Conducted:** Not specified**Test Dates:** Not specified**Material Technology:** Gloves are constructed from a nonpermeable rubber film**Glove Description:** North Viton gloves are made from fluorocarbon elastomer. The gloves are 28 cm (11 in) long and 254 μ (10 mil) nominal thickness.**Glove Application:** Submersion in water or any other type of liquid(s); biological; and liquefied gas conditions**Flame Resistance:** Not flame resistant**EOD Capability:** Not specified**CAPABILITIES****CAs Protected Against:** NFPA 1994 Class 1 CA permeation resistance (100 g/m²)**BAs Protected Against:** Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—Biological Threats)**TIMs Protected Against:** See chemical duration results**Duration of Protection:** 4 hAcrylonitrile—100 %—1 min—176 mg/m²/sec—ASTM F 739

Carbon disulfide—100 %—>8 h—ND—ASTM F 739

Chloroacetonitrile—100 %—>8 h—ND—ASTM F 739

Ethylene dibromide—100 %—>8 h—ND—ASTM F 739

Formaldehyde (37 %)—37 %—>16 h—ND—ASTM F 739

Methyl isocyanate—100 %—4 min—121 mg/m²/sec—ASTM F 739**Physical Resistance and Durability:**

- **Cut Resistance (ASTM F 1790):** 193 g (6.8 oz) per ASTM1790-97
- **Puncture Resistance (ASTM F 1342):** Cut Level 2 per ANSI/ISEA 105
- **Abrasion Resistance (ASTM D 3883):** The glove has not been tested
- **Resistance (Other):** The material does not degrade when exposed to petroleum, oil, and lubricants
- **Environmental Conditions (ASTM D 747):** The glove has not been tested
- **Independent Cold Temperature Testing:** The glove has not been tested

HUMAN FACTORS**Grip Texture:** Rounded fingertips

Comfort (ASTM F 1154): Not tested

Dexterity (ASTM F 2010): Not specified

Thickness: 254 μ (10 mil)—thickness is measured on the back of hand

Don/DoFF: 0 s to 30 s to don/doff. Assistance not needed. Glove can be worn directly over skin.

Ease of Entry: A liner is available that conforms to the shape of the glove

Gauntlet Length: 7.62 cm (3 in)

Glove Length: 27.94 cm (11 in)

Glove/Suit Interface: Not specified

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** 3 yr shelf life is recommended based on history
- **Shelf Life (Out of Package):** >1 yr based on history

Storage Conditions: 10 °C to 29 °C (50 °F to 85 °F); 20 % to 80 % rh

Sizes Available: X-small, small, medium, large, and X-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** No allergens
- **MSDS:** MSDS is available

Warranty: Not specified

GENERAL**Best Viton Medium-Weight Glove****Model:** 892

Best Manufacturing Company
 579 Edison Street
 Menlo, Georgia 30731
 Don Groce
 706-862-2302 (Tel)
 706-862-2660 (Fax)
 dgroce@bestglove.com

<http://www.bestglove.com>
 RKB

**OSHA EPA Level:** Not specified**Unit Cost:** \$54.50**Certification Status:** Not specified**NFPA Comments:** Not specified**Other Certifications:** Not specified**Independent Testing:** Not specified**Test Conducted:** Not specified**Test Dates:** Not specified**Material Technology:** Not specified**Glove Description:** Not specified**Glove Application:** Not specified**Flame Resistance:** Not specified**EOD Capability:** Not specified**CAPABILITIES****CAs Protected Against:** Not specified**BAs Protected Against:** Not specified**TIMs Protected Against:** Not specified**Duration of Protection:** Not specified**Physical Resistance and Durability:**

- **Cut Resistance (ASTM F 1790):** Not specified
- **Puncture Resistance (ASTM F 1342):** Not specified
- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** Not specified
- **Environmental Conditions (ASTM D 747):** Not specified
- **Independent Cold Temperature Testing:** Not specified

HUMAN FACTORS**Grip Texture:** Not specified**Comfort (ASTM F 1154):** Not specified**Dexterity (ASTM F 2010):** Not specified**Thickness:** Not specified**Don/Doff:** Not specified**Ease of Entry:** Not specified**Gauntlet Length:** Not specified**Glove Length:** Not specified**Glove/Suit Interface:** Not specified**LOGISTICS****TDP (Technical Data Package):** Not specified**Storage Conditions:** Not specified**Shelf Life (Packaged):** Not specified**Shelf Life (Out of Package):** Not specified**Sizes Available:** Not specified**Warranty:** Not specified**Health Hazards and Safety:**

- **Latex:** Not specified
- **Allergens:** Not specified
- **MSDS:** Not specified

GENERAL**North Butyl Glove**

Model: B131

North Safety Products
2000 Plainfield Pike
Cranston, Rhode Island 02921
Alex Marks
401-943-4400 (Tel)
401-275-2618 (Fax)
alex.marks@northsafety.com

http://www.northsafety.com
RKB

Unit Cost: \$13.50



OSHA EPA Level: Not specified

Certification Status: No third-party certifications in RKB for this product**NFPA Comments:** Not specified**Other Certifications:** Not specified**Independent Testing:** Not specified**Test Conducted:** Not specified**Glove Description:** Not specified**Test Dates:** Not specified**Flame Resistance:** Not specified**Glove Application:** Not specified**Material Technology:** Gloves are constructed from a nonpermeable butyl rubber film. Butyl gloves exhibit high permeation resistance to gas or water vapors. Ideal for use in ketones and esters.**EOD Capability:** Not specified**CAPABILITIES****CAs Protected Against:** Not specified**BAs Protected Against:** Not specified**TIMs Protected Against:** Not specified**Duration of Protection:** Ideal for use in ketones (e.g., M.E.K., M.I.B.K., acetone) and esters (e.g., tricresyl phosphate, amyl acetate, ethyl acetate)**Physical Resistance and Durability:**

- **Cut Resistance (ASTM F 1790):** Not specified
- **Puncture Resistance (ASTM F 1342):** Not specified
- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** Not specified
- **Environmental Conditions (ASTM D 747):** Not specified
- **Independent Cold Temperature Testing:** Not specified

HUMAN FACTORS**Grip Texture:** Grip safe palm, curved fingers, and smooth or rough grip**Comfort (ASTM F 1154):** Not specified**Dexterity (ASTM F 2010):** Not specified**Thickness:** 13 mil (0.33mm)**Don/Doff:** Not specified**Ease of Entry:** Not specified**Gauntlet Length:** Not specified**Glove Length:** Not specified**Glove/Suit Interface:** Not specified**LOGISTICS****TDP (Technical Data Package):** Not specified**Storage Conditions:** Not specified**Shelf Life (Packaged):** Not specified**Shelf Life (Out of Package):** Not specified**Sizes Available:** Not specified**Warranty:** Not specified**Health Hazards and Safety:**

- **Latex:** Not specified
- **Allergens:** Not specified
- **MSDS:** Not specified

GENERAL

Best Butyl Glove**Model:** 874, 874R

Best Manufacturing Company
579 Edison Street
Menlo, Georgia 30731
Don Groce
706-862-2302 (Tel)
706-862-2660 (Fax)
dgroce@bestglove.com

<http://www.bestglove.com>
RKB

**OSHA EPA Level:** Class 3/Level B**Unit Cost:** \$17**Certification Status:** Submitted NFPA 1994 (2001 Edition), Underwriters Laboratories, Inc.**NFPA Comments:** Not specified**Availability:** In stock**Other Certifications:** No third-party certifications in RKB for this product**Independent Testing:** No third-party certifications in RKB for this product**Test Conducted:** No third-party certifications in RKB for this product**Test Dates:** No third-party certifications in RKB for this product

Material Technology: Butyl gloves are made from 100 % butyl rubber which provides excellent protection from numerous chemicals by splash or total immersion. The gloves do not include an interface but fit readily onto suit sleeves with the proper clamps.

Glove Description: Several different styles are available including: Best Butyl 874, 100 % 14 mil thick butyl [36 cm (14 in long)]—Made in Germany. Chemical resistant to ketones, aldehydes, amines, amides, and gases. Resistant to many of the TIMs from soft targets. Very soft and pliable and good-fitting from ergonomic design features.

Best Butyl 874R, 100 % 14 mil thick butyl [36 cm (14 in long, rough textured grip)]—A rough textured medium-weight butyl glove that is designed for superior chemical protection and excellent dexterity and touch sensitivity. The gloves protect from CAs, TIMs, gases, ketones, and other chemicals. They have exceptional dexterity and touch sensitivity. Made in Germany. These gloves are excellent replacement parts for First Responder suits.

Best Butyl 878, 100 % 30 mil thick butyl [36 cm (14 in long)]—butyl glove, heavy-weight, designed for WMD. Designed for protection from the most hazardous chemicals including CAs and TIMs. Fits chemical resistant suit cuffs. Made in Germany.

Glove Application: Submersion in water or any other type of liquid(s), CB agents**Flame Resistance:** Not flame resistant**EOD Capability:** Not EOD compatible

CAPABILITIES

CAs Protected Against: NFPA 1994, Class 2 CA permeation resistance (10 g/m², closed top)**BAs Protected Against:** Meets NFPA 1994 by providing "systems level" aerosol threat protection**TIMs Protected Against:** See information published on www.chemrest.com**Duration of Protection:** Not specified

Not specified

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** The glove has not been tested
- **Puncture Resistance (ASTM F 1342):** Testing is pending
- **Abrasion Resistance (ASTM D 3883):** Testing is pending
- **Resistance (Other):** The material does not degrade when exposed to petroleum, oil, and lubricants
- **Environmental Conditions (ASTM D 747):** The glove has not been tested
- **Independent Cold Temperature Testing:** The glove has not been tested

HUMAN FACTORS

Grip Texture: Pumice overdip grip and wet/dry grip

Comfort (ASTM F 1154): Pending

Dexterity (ASTM F 2010): Not specified

Thickness: Best Butyl 874—356 μ (14 mil); Best Butyl 874R—356 μ (14 mil)

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed.

Ease of Entry: Not specified

Gauntlet Length: Best Butyl 874, 874R—15.8 cm (6.22 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit. Interface must be taped.

LOGISTICS

TDP (Technical Data Package): Contact dgroce@bestglove.com

Shelf Life:

- **Shelf Life (Packaged):** 6 yr to 10 yr based on historical testing of products that were aged
- **Shelf Life (Out of Package):** 3 mo to 6 mo based on history of the product and its characteristics

Storage Conditions: -18 °C to 25 °C (0 °F to 77 °F)

Sizes Available: X-small, small, medium, large, X-large, and XX-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** Rubber accelerators
- **MSDS:** MSDS for ingredients, not for the finished goods

Warranty: 1 yr after shipment—free of defects in materials and workmanship at the time of manufacture. Replacement or refund.

GENERAL

Chemical Protective Butyl Rubber Glove**Model:** CP-14, CP-14R, CP-14F, CP-14FR

Guardian Manufacturing Company
 302 Conwell Avenue
 Willard, Ohio 44890-9525
 Gene E. Lamoreaux
 419-933-2711 (Tel)
 419-935-8961 (Fax)
 glamro@willard-oh.com

<http://www.guardian-mfg.com>
 RKB

**Unit Cost:** \$18.37—1 pair to 35 pair; \$17.45—>36 pair**OSHA EPA Level:** Class 3/Level B**Certification Status:** Planned for NFPA 1994 submission**NFPA Comments:** Not specified**Availability:** In stock, minimum order required. 4 wk for 1000 pair, smaller quantities available through distributors.**Other Certifications:** MIL-DTL-43976**Independent Testing:** No third-party certifications in RKB for this Product**Test Conducted:** No third-party certifications in RKB for this Product**Test Dates:** No third-party certifications in RKB for this Product**Material Technology:** Constructed of an impermeable chemical resistant polymer. Guardian gloves are solution-dipped, providing unparalleled protection for their users. Tight molecular structures are the key to chemical impermeability. Our state-of-the-art microprocessors provide accurate controls every step of the way, from mixing our proprietary compounds, to dipping, curing and drying, in order to attain the necessary strength.**Glove Description:** Chemical protective butyl rubber glove designed to protect against CAs and various TICs and TIMs. The seamless glove finish is either smooth or rough, i.e., smooth grip, standard fit (CP-14); surgeon's glove fit (CP-14F); and roughened palm, standard fit (CP-14R); and surgeon's glove fit (CP-14FR). The medium-weight style, CP14FR, is available with a pumice overdip for greater grip capability. The additional pumice dip provides a glove which meets or exceeds the permeation capabilities of the smooth style.**Glove Application:** Not specified**Flame Resistance:** Not flame resistant**EOD Capability:** Probably not EOD compatible

CAPABILITIES

CAs Protected Against: Not specified**BAs Protected Against:** Not specified**TIMs Protected Against:** Not specified**Duration of Protection:** 4 h

Not specified

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** 70 g (2.47 oz)
- **Puncture Resistance (ASTM F 1342):** The glove has not been tested
- **Abrasion Resistance (ASTM D 3883):** The glove has not been tested
- **Resistance (Other):** The material degrades when exposed to petroleum, oil, and lubricants
- **Environmental Conditions (ASTM D 747):** The glove has not been tested
- **Independent Cold Temperature Testing:** ASTM D 1053

HUMAN FACTORS

Grip Texture: Pumice overdip grip, rounded fingertips to facilitate the manipulation of small items, wet/dry grip

Comfort (ASTM F 1154): Performance not measured

Dexterity (ASTM F 2010): Not specified

Thickness: 356 μ (14 mil) at the palm

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove can easily be turned inside out when pulled off for easy disposal. Glove can be worn directly over skin.

Ease of Entry: A liner is available that conforms to the shape of the glove

Gauntlet Length: 15.24 cm (6 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit

LOGISTICS

TDP (Technical Data Package): Not available

Shelf Life:

- **Shelf Life (Packaged):** 1 yr to 5 yr
- **Shelf Life (Out of Package):** Not specified

Storage Conditions: -40 °C to 49 °C (-40 °F to 120 °F); <90 % rh

Sizes Available: X-small, small, medium, large, and X-large. CP-14F and CP-14FR available in sizes 7, 8, and 9.

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** Thiuram; thiazol
- **MSDS:** MSDS is available

Warranty: 5 yr—Guardian warrants each pair of its gloves to be free from defects in material and workmanship that would affect the performance or serviceability of the glove

GENERAL

North Butyl Glove

Model: B174, B144GI

North Safety Products
2000 Plainfield Pike
Cranston, Rhode Island 02921
Alex Marks
401-943-4400 (Tel)
401-275-2618 (Fax)
alex.marks@northsafety.com

<http://www.northsafety.com>
RKB



OSHA EPA Level: Class 1/Level A

Unit Cost: \$53

Certification Status: No third-party certifications in RKB for this product

NFPA Comments: Not specified

Availability: In stock

Other Certifications: ANSI/ISEA 105-2000

Independent Testing: ASTM F739 Permeation Testing

Test Conducted: Not specified

Test Dates: Not specified

Material Technology: Gloves are constructed from a nonpermeable butyl rubber film. Butyl gloves exhibit high permeation resistance to gas or water vapors. Ideal for use in ketones and esters.

Glove Description: There are 5 models all are 36 cm (14 in) long with various thickness: B174—17 mil; B144GI—14 mil

Glove Application: Submersion in water or any other type of liquid(s); fused munitions; explosive atmospheres; biological; and deep frozen media

Flame Resistance: Not flame resistant

EOD Capability: EOD compatible

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 1 CA permeation resistance (100 g/m²). Test results are thickness dependent. North butyl gloves regularly pass agent testing in accordance with MIL-STD-282 section 209 for HD and MIL-STD-282 section 208 for GB.

25 mil thick passes 360 min for HD and 450 min for GB

14 mil thick passes 210 min. for HD and 450 min for GB

7 mil thick passes 75 min for HD and 360 min for GB

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—Biological Threats)

TIMs Protected Against: See chemical duration results

Duration of Protection: 6 h

Acrylonitrile—100 %—>8 h—N/D—ASTM F739

Allylamine—100 %—3.9 h—7 mg/m²/s—ASTM F739

Carbon disulfide—100 %—3 min—98.4 mg/m²/s—ASTM F739

Chloroacetonitrile—100 %—>8 h—N/D—ASTM F739

Ethylene dibromide—100 %—3.3 h—6.0 mg/m²/s—ASTM F739

Formaldehyde—37 %—>16 h—N/D—ASTM F739

Methyl isocyanate—100 %—1.1 h—9 mg/m²/s—ASTM F730

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Not specified

- **Puncture Resistance (ASTM F 1342):** ANSI/ISEA 105—B254GI Level 2, B174 Level 2, B144GI Level 1, B224GI Level 2
- **Abrasion Resistance (ASTM D 3883):** ANSI/ISEA 105—B254GI Level 3, B174 Level 3, B144GI Level 3, B224GI Level 3
- **Resistance (Other):** The material degrades when exposed to petroleum, oil, and lubricants. Material is antistatic. Butyl gloves exhibit high permeation resistance to gas or water vapors. Ideal for use in ketones and esters.
- **Environmental Conditions (ASTM D 747):** Glove has not been tested
- **Independent Cold Temperature Testing:** North butyl gloves pass ASTM D1053 and Mil-DLT-43976D for cold flex

HUMAN FACTORS

Grip Texture: Wet/dry grip

Comfort (ASTM F 1154): Not tested

Dexterity (ASTM F 2010): Not specified

Thickness: Thickness measured on the back of hand: B174—432 μ (17 mil); B114GI—356 μ (14 mil)

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove can be worn directly over skin.

Ease of Entry: A liner is available that conforms to the shape of the glove

Gauntlet Length: 15.24 cm (6 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** 5 yr recommended based on history. Gloves should be visually inspected before use.
- **Shelf Life (Out of Package):** >1 yr based on history

Storage Conditions: 10 °C to 29 °C (50 °F to 85 °F); 20 % to 80 % rh

Sizes Available: X-small, small, medium, large, and X-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** No other allergens
- **MSDS:** MSDS is available

Warranty: Not specified

GENERAL

Best Nitri Solve Glove**Model:** 717, 727, 730

Best Manufacturing Company
 579 Edison Street
 Menlo, Georgia 30731
 Don Groce
 706-862-2302 (Tel)
 706-862-2660 (Fax)
 dgroce@bestglove.com

<http://www.bestglove.com>
 RKB

**OSHA EPA Level:** Class 3/Level B**Unit Cost:** \$5.30**Certification Status:** NFPA 1992 (2005 Edition) as stand-alone glove**NFPA Comments:** July 7, 2005—UL# MH30026**Availability:** In stock**Other Certifications:** Not specified**Independent Testing:** SATRA Quality Assurance, Ltd.**Test Conducted:** EN 420, EN 388, EN 420, EN 374-2, EN 374-3**Test Dates:** November 25, 2004 and December 17, 2004

Material Technology: Nitri-Solve gloves are made from 100 % Nitrile which provides excellent protection from numerous chemicals by splash or total immersion. The gloves do not include an interface, but fit readily onto suit sleeves with the proper clamps.

Glove Description: Best Nitri-Solve gloves have a cotton-flock lining and a bisque textured grip. They come packed a dozen pairs per bag. Nitri-Solve gloves work very well in aliphatic hydrocarbons, fuels, and perchloroethylene.

Several different styles are available including:

Nitri-Solve 717, 100 % 11 mil thick Nitrile—33 cm (13 in) long

Nitri-Solve 727, 100 % 15 mil thick Nitrile—33 cm (13 in) long

Nitri-Solve 730, 100 % 15 mil thick Nitrile—33 cm (13 in) long, flock lining

Glove Application: Submersion in water or any other type of liquid(s) and biological. Fuels, diesel, gasoline, jet fuel, kerosene, oils, and petroleum hydrocarbons.

Flame Resistance: Not flame resistant

EOD Capability: Not EOD compatible

CAPABILITIES

CAs Protected Against: Not specified

BAs Protected Against: Not specified

TIMs Protected Against: Meets 1994, 1991, and 1992 plus limited vapor (suit test); see information published on www.chemrest.com.

Duration of Protection: Protection based on mid range within this product line

Acrylonitrile—1100 %—Not Recommended—NR—ASTM F 739

Ammonia—gas—336 min breakthrough—0.6 permeation rate—EN—ASTM F 739

Carbon disulfide—gas—Not Recommended—NR—ASTM F739

Chlorine—gas—>480—NR—ASTM F739

Ethylene oxide—gas—17 min breakthrough—500 permeation rate—EN—ASTM F739

Formaldehyde (37 %)—37 %—>480 min breakthrough—ND—ASTM F739

Hydrogen chloride—gas—433 min breakthrough—0.64 permeation rate—EN—ASTM F739

Hydrogen fluoride—gas—1 min breakthrough—1343 permeation rate—EN—ASTM F739

Sulfuric acid, concentrated—97 %—180 min breakthrough—48 permeation rate—ASTM F739

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** The glove has not been tested
- **Puncture Resistance (ASTM F 1342):** Testing is pending
- **Abrasion Resistance (ASTM D 3883):** Testing is pending
- **Resistance (Other):** The material does not degrade when exposed to petroleum, oil, and lubricants
- **Environmental Conditions (ASTM D 747):** The glove has not been tested
- **Independent Cold Temperature Testing:** The glove has not been tested

HUMAN FACTORS

Grip Texture: Wet/dry grip

Comfort (ASTM F 1154): Pending

Dexterity (ASTM F 2010): Not specified

Thickness: Nitri-Solve 717—279 μ (11 mil); Nitri-Solve 727—381 μ (15 mil); Nitri-Solve 730—381 μ (15 mil)

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove must be taped.

Ease of Entry: Not specified

Gauntlet Length: Nitri-Solve 717, 727, 730, 737—13.26 cm (5.22 in)

Glove Length: Nitri-Solve 717, 727, 730—33 cm (13 in); Nitri-Solve 737—38 cm (15 in); Nitri-Solve 717—48.26 cm (19 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit. Interface must be taped.

LOGISTICS

TDP (Technical Data Package): Contact dgroce@bestglove.com

Shelf Life:

- **Shelf Life (Packaged):** 6 yr to 10 yr based on historical testing of product that was that age
- **Shelf Life (Out of Package):** 3 mo to 6 mo based on history of the product and its characteristics

Storage Conditions: -18 °C to 25 °C (0 °F to 77 °F)

Sizes Available: X-small, small, medium, large, X-large, and XX-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** Rubber accelerators (benzothiazoles and carbamates)
- **MSDS:** MSDS for ingredients, not for the finished goods

Warranty: 1 yr after shipment—free of defects in materials and workmanship at the time of manufacture. Replacement or refund.

GENERAL**North Nitrile Glove****Model:** LA172G

North Safety Products
 2000 Plainfield Pike
 Cranston, Rhode Island 02921
 Alex Marks
 401-943-4400 (Tel)
 401-275-2618 (Fax)
 alex.marks@northsafety.com

 http://www.northsafety.com

**OSHA EPA Level:** Class 3/Level B**Unit Cost:** \$29.78/doz**Certification Status:** Not specified**NFPA Comments:** Not specified**Availability:** In stock**Other Certifications:** ANSI/ISEA 105-2000**Independent Testing:** ASTM F739 Permeation Testing**Test Conducted:** Not specified**Test Dates:** Not specified**Material Technology:** Gloves are constructed from a nonpermeable nitrile rubber film**Glove Description:** The North LA172G glove has a length of 33 cm (13 in) and thickness of approximately 432 μ (17 mil). This green glove has a cotton flock lining to absorb hand perspiration.**Glove Application:** Submersion in water or any other type of liquid(s); fused munitions; explosive atmospheres; and biological**Flame Resistance:** Not flame resistant**EOD Capability:** EOD compatible**CAPABILITIES****CAs Protected Against:** NFPA 1994 Class 1 CA permeation resistance (100 g/m²)**BAs Protected Against:** Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—Biological Threats)**TIMs Protected Against:** See chemical duration results**Duration of Protection:** 6 hAcrylonitrile—100 %—3 min—176mg/m²/s—ASTM F739Carbonyl sulfide—100 %—9 min—51mg/m²/s—ASTM F739

Formaldehyde—37 %—21 h—N/D—ASTM F739

Hydrogen chloride—37 %—>6 h—N/D—ASTM F739

Nitric acid, fuming—40 %—>6 h—N/D—ASTM F739

Sulfuric acid, concentrated—50 %—>6 h—N/D—ASTM F739

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Not specified
- **Puncture Resistance (ASTM F 1342):** Not specified
- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** The material does not degrade when exposed to petroleum, oil, and lubricants. Material is antistatic.
- **Environmental Conditions (ASTM D 747):** The glove has not been tested
- **Independent Cold Temperature Testing:** The glove has not been tested

HUMAN FACTORS**Grip Texture:** Rounded fingertips to facilitate the manipulation of small items and wet/dry grip. The glove has a wet grip pattern molded into the hand and fingers.**Comfort (ASTM F 1154):** Performance not measured

Dexterity (ASTM F 2010): Not specified

Thickness: 432 μ (17 mil) measured on the back of hand

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove can be worn directly over skin.

Ease of Entry: A liner is available that conforms to the shape of the glove

Gauntlet Length: 12.7 cm (5 in)

Glove Length: 33 cm (13 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** 3 yr shelf life is recommended based on history. Gloves should be visually inspected before use.
- **Shelf Life (Out of Package):** >1 yr based on history

Storage Conditions: 10 °C to 29 °C (50 °F to 85 °F); 20 % to 80 % rh

Sizes Available: X-small, small, medium, large, and X-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** No allergens
- **MSDS:** MSDS is available

Warranty: Not specified

GENERAL

HyTrial Nitrile Glove

Model: 18-NDFB-7

Talleyrand Industries
900 2nd Street NE
Washington, DC 20002
USA
877-898-2553 (Tel)
877-778-2553 (Fax)
Export contact: Drew Patterson

Amamsco
<http://www.kcprofessional.com/us/product-details.asp?search=v1&searchtext=55090&x=11&y=9>
Unit Cost: \$35.38



OSHA EPA Level: Class 3/Level B

Certification Status: NFPA 1994 (2001 Edition) Class 3 with JetGuard® PLUS Class 3 Ensemble (Indutex S.p.A.)

NFPA Comments: Not specified

Independent Testing: Not specified

Other Certifications: CE Certified

Test Dates: Not specified

Test Conducted: Not specified

Flame Resistance: Not specified

Glove Application: Not specified

EOD Capability: Not specified

Material Technology: Nitrile gloves, designed to replace butyl gloves in the WMD market

Glove Description: HyTrial nitrile formulation insures maximum: durability; dexterity; cut/puncture resistance; protection from oils, fats, solvents and other materials. Flock lining provides maximum comfort and easy access/removal.

CAPABILITIES

CAs Protected Against: When using a double glove system,* the gloves passed warfare agent testing with the following chemicals: HD, L, GB, VX, and dimethyl sulfate (DMA). *The Inner Glove used during testing was the SAFESKIN* purple Nitrile Glove.

BAs Protected Against: Not specified

TIMs Protected Against: Not specified

Duration of Protection: Not specified

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Not specified
- **Puncture Resistance (ASTM F 1342):** Not specified
- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** Not specified
- **Environmental Conditions (ASTM D 747):** Not specified
- **Independent Cold Temperature Testing:** Not specified

HUMAN FACTORS

Grip Texture: Diamond grip assures maximum safety in handling wet, smooth objects, cutlery, and tools

Comfort (ASTM F 1154): Not specified

Dexterity (ASTM F 2010): Not specified

Thickness: 457 μ (18 mil)

Don/Doff: Not specified

Ease of Entry: Not specified

Gauntlet Length: Not specified

Glove Length: 13 in

Glove/Suit Interface: Not specified

LOGISTICS

TDP (Technical Data Package): Not specified

Storage Conditions: Not specified

Shelf Life (Packaged): Not specified

Shelf Life (Out of Package): Not specified

Sizes Available: Large, X-large, and XX-large

Warranty: Not specified

Health Hazards and Safety:

- **Latex and Allergens:** Not specified
- **MSDS:** Not specified

GENERAL**GORE™ Chempak® Ultra Barrier Glove Liner****Model:** G9492-C2

W. L. Gore & Associates, Inc.
 105 Vieve's Way
 Elkton, MD 21921
 Debbie Fitzgerald
 800-431-4673 (Tel)
 410-506-5486 (Fax)
 dfitzger@wlgore.com

http://www.goremilitary.com/tech_05_mil.html#
 LES Enterprises
 (418) 337-2766

Unit Cost: LES Enterprises (418-337-2766)
 Other: www.dscp.dla.mil

**OSHA EPA Level:** Class 2/Level B

Certification Status: NFPA 1994 (2001 Edition) Class 2 with Tactix Brand® MT-94™ (Lion Apparel)
 NFPA 1992 (2005 Edition) certified with Tactix Brand® MT-94™ (Lion Apparel)

NFPA Comments: Not specified**Availability:** GORE™ CHEMPAK® Ultra Barrier Glove Liner

Liner only—DSCP information [NSN: 8415-01-517 (3860 to 3865*)]

Glove system—DSCP information [NSN: 8415-01-517 (5843 to 5848*)]

Other Certifications: Not specified**Independent Testing:** Not specified**Test Conducted:** Not specified**Test Dates:** Not specified

Material Technology: GORE™ CHEMPAK® Ultra Barrier Glove Liners are made with a polytetrafluoroethylene (PTFE) film. In laboratory testing, the liners maintained their protective properties even after exposure to a wide range of contaminants that may be encountered in the wartime theater, such as petroleum, oils, and lubricants. Accelerated aging tests predict a storage life of over 20 yr, which translates to cost reductions in shelf life surveillance and inventory replacement. GORE™ CHEMPAK® Ultra Barrier Glove Liners are approved for use by JPEO-CBD.

Glove Description: The GORE™ CHEMPAK® Ultra Barrier Glove Liner is the effective solution to the military's need for thin, dexterous, lightweight, durable hand protection. This new glove system enhances operational effectiveness, even in continuously changing conflict scenarios.

Glove Application: Soldiers face a variety of CA threats, which is why they need protection against a broad range of chemicals. The revolutionary GORE™ CHEMPAK® Ultra Barrier Glove Liner is the effective solution to the military's need for thin, dexterous, lightweight, durable hand protection. This new glove system enhances operational effectiveness, even in continuously changing conflict scenarios.

Flame Resistance: Improved tactility; CA resistant; POL contamination resistant; improved moisture management; flame-resistant; increased shelf life; and quality assured

EOD Capability: Not specified**References:** GORE™ CHEMPAK® Ultra Barrier Glove Liners are approved for use by JPEO-CBD**CAPABILITIES****CAs Protected Against:** CA resistant**BAs Protected Against:** GORE™ CHEMPAK® products deliver functional effectiveness in chemical and biological environments**TIMs Protected Against:** POL contamination resistant**Duration of Protection:** 24 h

Not specified

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Not specified
- **Puncture Resistance (ASTM F 1342):** Not specified
- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** Not specified
- **Environmental Conditions (ASTM D 747):** Not specified
- **Independent Cold Temperature Testing:** Not specified

HUMAN FACTORS

Grip Texture: Not specified

Comfort (ASTM F 1154): With a range of features and benefits such as breathability, mobility, and lighter weight, they help military and civil defense personnel and first responders operate more effectively

Dexterity (ASTM F 2010): Improved tactility

Thickness: 12.7 μ [0.5 mil (<0.0005 in) thick]

Don/Doff: Not specified

Ease of Entry: Not specified

Gauntlet Length: Not specified

Glove Length: Not specified

Glove/Suit Interface: Not specified

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** Accelerated aging tests predict a storage life of over 20 yr, which translates to cost reductions in shelf life surveillance and inventory replacement
- **Shelf Life (Out of Package):** Not specified

Storage Conditions: Not specified

Sizes Available: Not specified

Health Hazards and Safety:

- **Latex:** Not specified
- **Allergens:** Not specified
- **MSDS:** Not specified

Warranty: Not specified

GENERAL

Ansell Flat-Film, Hand-Specific, Non-Woven Liner

Model: 2-100

Ansell Healthcare
200 Schulz Drive
Red Bank, New Jersey 07701
Jamie Ashworth
800-800-0444(Tel)
585-223-2887 (Tel)
800-800-0445 (Fax)
jashworth@ansell.com

<http://www.ansellpro.com>
RKB



Unit Cost: \$6.37

OSHA EPA Level: Class 1/Level A

Certification Status: NFPA 1994 Class 1 with Tychem® Responder (DuPont)

NFPA 1994 Class 1 with Tychem® TK (DuPont)

NFPA 1994 Class 1 with Zytron 500 ® (Kappler)

NFPA 1994 Class 3 with Tychem ® CPF3 (DuPont)

NFPA 1994 Class 3 with Zytron 300 ® (Kappler)

NFPA 1991 (2005 Edition) with Commander® EX Brigade (DuPont)

NFPA 1991 (2005 Edition) with Tychem® Responder (DuPont)

NFPA 1991 (2005 Edition) with Tychem® Reflector (DuPont)

NFPA Comments: Not specified

Availability: In stock, minimum order required. Minimum quantity is 1 case (72 pair); average lead time is 5 business d to 7 business d from date of order.

Other Certifications: A special sealing process ensures strong seams that provide additional strength in high-stress areas. Seam strength exceeds the ASTM pressure test F1052-87.

Independent Testing: No third-party certifications in RKB for this product

Test Conducted: No third-party certifications in RKB for this product

Test Dates: No third-party certifications in RKB for this product

Material Technology: A major breakthrough in flat-film glove technology, Barrier gloves feature a unique nonwoven liner that absorbs perspiration and makes the gloves comfortable to wear, especially for extended periods. Proprietary polymer protects workers against a wide range of chemicals; liner keeps workers' hands dry and comfortable.

Glove Description: The winged-thumb, hand-specific design provides greater dexterity. Proprietary seam-fusion technology provides a secure seal against chemicals and also assures a flexible, comfortable fit for greater dexterity and reduced hand fatigue.

- Single pair packed ensures gloves have not been contaminated or compromised
- Form-fitting, gives workers better dexterity over traditional flat film gloves
- Patented electronic seam technology locks out chemicals

Glove Application: Petrochemicals and refining, chemical transport, HazMat work, and aircraft and aerospace applications

Flame Resistance: Unknown performance—glove not tested against this hazard

EOD Capability: Unknown performance—glove not tested against this hazard

CAPABILITIES

CAs Protected Against: Not specified

BAs Protected Against: Not specified

TIMs Protected Against: See chemical duration results

Duration of Protection: Additions per Chemical Resistance Guide 7th Edition and the Barrier product brochure Form No. BPP Rev. 11-98

Acetone cyanohydrin—>480 min breakthrough—E permeation—ASTM 739

Acrylonitrile—>480 min breakthrough—E permeation—ASTM 739

Allyl alcohol—>480 min breakthrough—E permeation—ASTM 739
Allylamine—20 min breakthrough—E permeation—ASTM 739
Ammonia—gas—19 min breakthrough—E permeation—ASTM 739
Carbon disulfide—>480 min breakthrough—E permeation—ASTM 739
Ethylene oxide—234 min breakthrough—E permeation—ASTM 739
Formaldehyde (37 %)—unsure of exact concentraion—>480 min breakthrough—E permeation—ASTM 739
Hydrogen fluoride—gas—>480 min breakthrough—E permeation—ASTM 739
Methyl isocyanate—breakthrough not tested
Nitric acid, fuming—>480 min breakthrough—E permeation—ASTM 739
Sulfuric acid, concentrated—95 %—>480 min breakthrough—E permeation—ASTM 739

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** 262 g (9.24 oz)
- **Puncture Resistance (ASTM F 1342):** NOTE: ANSI/ISEA 105–2000 actually specifies method EN 388:1994 to which the glove has been evaluated. Measured results are 9.0 N (2.02 lbf) average [range: 8.0 N to 10.5 N (1.8 lbf to 2.36 lbf)].
- **Abrasion Resistance (ASTM D 3883):** 200 rev to 300 rev (average 272 rev) at 500 g (17.64 oz) weight load; 100 rev to 200 rev (average 128 rev) at 1000 g (35.27 oz) weight load
- **Resistance (Other):** The material is somewhat, but not highly tear, cut, puncture, and abrasion resistant
- **Environmental Conditions (ASTM D 747):** Unknown, performance not measured
- **Independent Cold Temperature Testing:** Gloves have not been tested

HUMAN FACTORS

Grip Texture: Smooth film with seams-out design is not conducive to superior grip or fingertip tactility/dexterity

Comfort (ASTM F 1154): Performance not measured

Dexterity (ASTM F 2010): Handed glove with winged-thumb for dexterity enhancement

Thickness: 5 layer polymer film 63.5 μ (2.5 mil) thick throughout with approximately 127 μ (5 mil) of nylon nonwoven scrim for comfort and perspiration absorption. Handed glove with winged-thumb for dexterity enhancement.

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Nonwoven nylon scrim lining minimizes tackiness on the glove interior due to hand perspiration. Glove does not have to be taped.

Ease of Entry: A nylon scrim layer is incorporated into the design that conforms to the shape of the glove

Gauntlet Length: Not specified

Glove Length: Sizes 6 to 9—38.1 cm (15 in); sizes 10 to 11—40.6 cm (16 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit

LOGISTICS

TDP (Technical Data Package): Procure through Ansell customer service or an Ansell sales representative

Shelf Life:

- **Shelf Life (Packaged):** 1 yr to 5 yr. Composition is largely polyethylene, which has excellent shelf life potential. Remove residual chemicals from glove surface after exposure. Discard when visible signs of wear appear or if damaged during use.
- **Shelf Life (Out of Package):** >1 yr not based on scientific evidence

Storage Conditions: <32 °C (<90 °F)—keep unused product stored in its original packaging for added protection

Sizes Available: X-small, small, medium, large, X-large, and XX-large. Sizing range for full sizes is size 6 to size 11.

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** No allergens
- **MSDS:** Ansell products are exempt from MSDS requirements

Warranty: Within 24 mo of purchase. Ansell products are guaranteed against defect in workmanship or material and will be replaced or credited if returned for examination. Not guaranteed against deterioration caused by wear, age, abuse, or lengthy exposure to strong chemicals. Returned goods will not be accepted without prior approval of Ansell Customer Service or an Ansell Sales Representative.

GENERAL

North Silver ShieldT/4H® Glove

Model: SSG

North Safety Products
 2000 Plainfield Pike
 Cranston, Rhode Island 02921
 Alex Marks
 401-943-4400 (Tel)
 401-275-2618 (Fax)
 alex.marks@northsafety.com

<http://www.northsafety.com>
 RKB



Unit Cost: \$5.15

OSHA EPA Level: Class 1/Level A

Certification Status: NFPA 1994 Class 1 with STEPO, Fully Encapsulating Coverall Ensemble (Saint-Gobain)
 NFPA 1994 Class 1 with Trellechem® VPS VP1 (Trelleborg)
 NFPA 1994 Class 2 with Trellechem® HPS Trelleborg)
 NFPA 1994 Class 2 with Trellechem® VPS Trelleborg)
 NFPA 1992 (2005 Edition) with ITAP (Improved Toxicological Agent Protective Ensemble) (Saint-Gobain)

NFPA Comments: Not specified**Availability:** In stock**Other Certifications:** ANSI/ISEA 105-2000**Independent Testing:** ASTM F739 Permeation Testing**Test Conducted:** Not specified**Test Dates:** Not specified**Material Technology:** Made of high-energy polymer (EVOH) and a low-energy polymer (PE) compacted into a 68.6 μ (2.7 mil) thickness**Glove Description:** Low-cost disposable gloves that can be used as a secondary liner. Ambidextrous. This excellent chemical protection and lightweight flexibility make North SilvershieldT/4H® Gloves ideal for chemical and petroleum laboratories, spill cleanups, hazmat control, and photo finishing. Made in the U.S.A.**Glove Application:** Submersion in water or any other type of liquid(s) and biological**Flame Resistance:** Not flame resistant**EOD Capability:** Not specified

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 2 CA permeation resistance (100 g/m²). North SilverShield gloves offer greater than 8 h protection from HD and GB.**BAs Protected Against:** Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—Biological Threats)**TIMs Protected Against:** Resistant to over 280 chemicals**Duration of Protection:** 4 h

Acrolein—100 %—>8 h—N/D—ASTM F739

Acrylonitrile—100 %—>8 h—N/D—ASTM F739

Allylamine—100 %—15 min—mg/m²/sec—ASTM F739Ammonia—100 %—36 min—0.33 mg/m²/sec—ASTM F739

Carbon disulfide—100 %—>24 h—N/D—ASTM F739

Chlorine—100 %—>8 h—N/D—ASTM F739

Chloroacetone—100 %—>4 h—N/D—ASTM F739

Ethylene oxide—100 %—>8 h—N/D—ASTM F739

Formaldehyde—37 %—>8 h—N/D—ASTM F739

Hydrogen chloride—37 %—>8 h—N/D—ASTM F739

Hydrogen cyanide—100 %—>4 h—N/D—ASTM F739
Hydrogen fluoride—48 %—>8 h—N/D—ASTM F739
Nitric acid, fuming—70 %—>6 h—N/D—ASTM F739
Sulfuric acid, concentrated—93 %—>24 h—N/D—ASTM F739

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** The glove has not been tested
- **Puncture Resistance (ASTM F 1342):** Not specified
- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** The material does not degrade when exposed to petroleum, oil, and lubricants
- **Environmental Conditions (ASTM D 747):** The glove has not been tested
- **Independent Cold Temperature Testing:** The glove has not been tested

HUMAN FACTORS

Grip Texture: Not specified

Comfort (ASTM F 1154): Performance not measured

Dexterity (ASTM F 2010): Not specified

Thickness: 69 μ (2.7 mil)—thickness is uniform all over the glove

Don/DoFF: 0 s to 30 s to don/doff. Assistance not needed. Glove can be worn directly over skin.

Ease of Entry: A liner is available that conforms to the shape of the glove

Gauntlet Length: 15.24 cm (6 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: Not specified

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** 5 yr shelf life is recommended based on history. Gloves should be visually inspected before use.
- **Shelf Life (Out of Package):** >1 yr based on history

Storage Conditions: 10 °C to 29 °C (50 °F to 85 °F); 20 % to 80 % rh

Sizes Available: X-small, small, medium, large, and X-large; available in sizes 6 to 11

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** Does not contain chemical accelerators that can cause allergic reactions
- **MSDS:** MSDS is available

Warranty: Not specified

GENERAL

SAFESKIN* PURPLE NITRILE-XTRA* Exam Gloves

Model: 55090

Kimberly Clark
1400 Holcomb Bridge Road
Roswell, Georgia 30076
USA
770-587-8000 (Tel)

Amamsco
<http://www.kcprofessional.com/us/product-details.asp?search=v1&searchtext=55090&x=11&y=9>



Unit Cost: \$8.50/box of 100

OSHA EPA Level: Class 3/Level B

Certification Status: NFPA 1994 Class 3 with JetGuard® PLUS Class 3 Ensemble (Indutex S.p.A.)

NFPA Comments: UL# MH 29808

Other Certifications: Not specified

Independent Testing: Not specified

Test Conducted: Not specified

Test Dates: Not specified

Material Technology: Not specified

Glove Application: Not specified

Flame Resistance: Not specified

EOD Capability: Not specified

Glove Description: In any healthcare setting, protection from exposure to microorganisms is of critical importance for you and for the patients under your care. Gloves provide the primary shield required to prevent contact with infectious substances, including blood borne pathogens, and reduce the risk of cross-contamination. From proprietary latex and nitrile formulations made under the strictest quality control for use in high-risk procedures, to economical vinyl for low-risk situations, there is a Kimberly-Clark SAFESKIN glove, including gloves for primary care services, diagnostic tests, surgical procedures, dental procedures, and general use applications. Functional benefits: Unique purple color provides quick, visual differentiation from natural rubber latex and other synthetic gloves. Custom design enhances comfort and fit. Available in 23 cm (9 in) and 30 cm (12 in) lengths. Available in sterile singles and pairs.

CAPABILITIES

CAs Protected Against: Not specified

BAs Protected Against: Not specified

TIMs Protected Against: Not specified

Duration of Protection: Purple Nitrile-XTRA material has been tested for use with 10 chemotherapy drugs and glutaraldehyde to determine permeation and breakthrough times

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Not specified
- **Puncture Resistance (ASTM F 1342):** Quality Standards: Exceeds current ASTM D 6319 standard for critical defects (AQL-2.5). Safeskin AQL for critical defects is 1.5. Manufactured in accordance with Quality System ISO 9002. Biocompatible as measured by Primary Skin Irritation, Repeat Challenge Sensitization and 200 Person Modified Draize Test. Sterilized in accordance with AAMI guidelines at a Sterility Assurance Level (SAL) of 10⁻⁶.
- Physical properties (target): Before aging tensile strength—21 Mpa, ultimate elongation—550 %; after aging tensile strength—21 Mpa, ultimate elongation—500 %.
- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** Not specified
- **Environmental Conditions (ASTM D 747):** Not specified
- **Independent Cold Temperature Testing:** Not specified

HUMAN FACTORS

Grip Texture: Textured fingertips enhance wet and dry grip

Comfort (ASTM F 1154): Not specified

Dexterity (ASTM F 2010): Not specified

Thickness: 119 μ (4.7 mil)

Don/Doff: Not specified

Ease of Entry: Not specified

Gauntlet Length: Not specified

Glove Length: 242 mm (9.5 in); 305 mm (12 in)

Glove/Suit Interface: Not specified

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** Not specified
- **Shelf Life (Out of Package):** Not specified

Storage Conditions: Not specified

Sizes Available: Not specified

Health Hazards and Safety:

- **Latex:** Natural rubber latex-free—primary material is acrylonitrile-butadiene, reducing the potential for glove-associated Type I allergic reactions to natural rubber latex proteins
- **Allergens:** Powder-free, minimizing the potential for powder-related complications, such as irritant contact dermatitis
- **MSDS:** Not specified

Warranty: Not specified

GENERAL**Lanx Chemical Protective Glove Liner****Model:** CPU-GL

Lanx Fabric Systems
 9947 Hull Street Road, Suite 280
 Richmond, Virginia 23236
 Randall D. Lofland
 804-423-5798 (Tel)
 804-423-5799 (Fax)
 lanx@earthlink.net

<http://www.lanxfabrics.com>
 RKB

**Unit Cost:** \$38/pair**OSHA EPA Level:** Class 3/Level B**Certification Status:** NFPA has no standard for glove liners and no standard for air-permeable materials**NFPA Comments:** Not specified**Availability:** Manufactured on demand. 4 wk depending on order size.**Other Certifications:** Glove liners are manufactured with Lanx Type I fabric per Military Specification MIL-U-44435**Independent Testing:** ECBE**Test Conducted:** Air-Permeable Charcoal Impregnated Suits**Test Dates:** September 2002**Material Technology:** The Lanx Glove Liner is an air permeable technology employing polymerically encapsulated activated carbon for the adsorption of CAs. It is designed to be worn beneath a leather or butyl rubber glove for additional protection.**Glove Description:** The Lanx Glove Liner is available in small, medium, large, and extra large. The glove covers the skin from the finger tips to the middle of the forearm. The stretch characteristics of the JSLIST approved Lanx Type I Fabric allow for a snug fit.**Glove Application:** CA environments**Flame Resistance:** Not flame resistant—it is manufactured for chemical protection (vapor protective)**EOD Capability:** It is currently in use with Med-Eng bomb suits**References:** 101st WMD CST (Alaska) 4 yr in use

3rd WMD CST (Pennsylvania) 4 yr in use

4th WMD CST (Georgia) 5 yr in use

Houston SWAT (Texas) 4 yr in use

CAPABILITIES**CAs Protected Against:** Not specified**BAs Protected Against:** The glove liner is vapor protective**TIMs Protected Against:** As most TICs/TIMs are respiratory threats, we have not done this testing**Duration of Protection:** 3 h to 16 h

Not specified

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** The glove has not been tested
- **Puncture Resistance (ASTM F 1342):** The glove has not been tested
- **Abrasion Resistance (ASTM D 3883):** The glove has not been tested
- **Resistance (Other):** The glove liner is an interior glove made for backup vapor protection. It is not evaluated like an exterior glove. The material is not tear, cut, puncture, and abrasion resistant. Material is antistatic.
- **Environmental Conditions (ASTM D 747):** The glove has not been tested

- **Independent Cold Temperature Testing:** Please note: NFPA 1994 is written for barrier technologies (as are NFPA 1991 and 1992). Our products are air permeable and meet U.S. Military Specification MIL-U-44485.

HUMAN FACTORS

Grip Texture: Not applicable

Comfort (ASTM F 1154): Performance not measured

Dexterity (ASTM F 2010): Not specified

Thickness: 119 μ (4.7 mil)

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove is integrated as part of the ensemble/garment and is removable (with instructions). Glove can easily be turned inside out when pulled off for easy disposal. Glove can be worn directly over skin. Glove does not have to be taped.

Ease of Entry: The Lanx CPU Glove Liner is a liner

Gauntlet Length: 12.7 cm (5 in)

Glove Length: 38.1 cm (15 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** 11 yr to 15 yr based on annual Vertrel testing of original fabric production (1991)
- **Shelf Life (Out of Package):** 3 mo to 6 mo based on annual Vertrel testing of original fabric production

Storage Conditions: Do not store in direct sunlight

Sizes Available: Small, medium, large, and X-large. Custom sizes may be available.

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** No allergens
- **MSDS:** MSDS is available

Warranty: Manufacturer guarantees the glove liners will be manufactured with Lanx Type I Fabric per MIL-U-44435 per Lanx standard design. All defective glove liners will be replaced at no charge if the defect is the fault of the manufacturer.

GENERAL**Chemical Protective Butyl Rubber Glove****Model:** CP-7

Guardian Manufacturing Company
 302 Conwell Avenue
 Willard, Ohio 44890-9525
 Gene E. Lamoreaux
 419-933-2711 (Tel)
 419-935-8961 (Fax)
 glamro@willard-oh.com

<http://www.guardian-mfg.com>

**OSHA EPA Level:** Class 3/Level B**Unit Cost:** \$8.36/pair, case price**Certification Status:** Planned for NFPA 1994 submission**NFPA Comments:** Not specified

Availability: In stock, minimum order required. 4 wk for 1000 pair, smaller quantities available through distributors.

Other Certifications: MIL-DTL-43976**Independent Testing:** Not specified**Test Conducted:** Not specified**Test Dates:** Not specified**Material Technology:** Constructed of an impermeable chemical-resistant polymer**Glove Description:** Chemical protective butyl rubber glove designed to protect against CAs and various TICs and TIMs**Glove Application:** Not specified**Flame Resistance:** Not flame resistant**EOD Capability:** Probably not EOD compatible**References:** Defense Supply Center Philadelphia—12 000 000 units for 22 yr**CAPABILITIES****CAs Protected Against:** Not specified**BAs Protected Against:** Not specified**TIMs Protected Against:** Not specified**Duration of Protection:** 1.25 h**Physical Resistance and Durability:**

- **Cut Resistance (ASTM F 1790):** 50 g (1.76 oz)
- **Puncture Resistance (ASTM F 1342):** The glove has not been tested
- **Abrasion Resistance (ASTM D 3883):** The glove has not been tested
- **Resistance (Other):** The material degrades when exposed to petroleum, oil, and lubricants
- **Environmental Conditions (ASTM D 747):** The glove has not been tested
- **Independent Cold Temperature Testing:** The glove has not been tested

HUMAN FACTORS**Grip Texture:** Rounded fingertips to facilitate the manipulation of small items and wet/dry grip**Comfort (ASTM F 1154):** Performance not measured**Dexterity (ASTM F 2010):** Not specified**Thickness:** 178 μ (7 mil) at the palm

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove can easily be turned inside out when pulled off for easy disposal. Glove can be worn directly over skin.

Ease of Entry: A liner is available that conforms to the shape of the glove

Gauntlet Length: 15.24 cm (6 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit

LOGISTICS

TDP (Technical Data Package): Not available

Shelf Life:

- **Shelf Life (Packaged):** 1 yr to 5 yr
- **Shelf Life (Out of Package):** Not specified

Storage Conditions: -40 °C to 49 °C (-40 °F to 120 °F); <90 % rh

Sizes Available: X-small, small, medium, large, and X-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** Thiuram; thiazol
- **MSDS:** MSDS is available

Warranty: 5 yr—Guardian warrants each pair of its gloves to be free from defects in material and workmanship that would affect the performance or serviceability of the glove

GENERAL**North Butyl Glove****Model:** B074GI

North Safety Products
 2000 Plainfield Pike
 Cranston, Rhode Island 02921
 Alex Marks
 401-943-4400 (Tel)
 401-275-2618 (Fax)
 alex.marks@northsafety.com

<http://www.northsafety.com>
 RKB

**OSHA EPA Level:** Class 1/Level A**Unit Cost:** \$53**Certification Status:** No third-party certifications in RKB for this product**NFPA Comments:** Not specified**Availability:** In stock**Other Certifications:** ANSI/ISEA 105-2000**Independent Testing:** ASTM F739 Permeation Testing**Test Conducted:** Not specified**Test Dates:** Not specified**Material Technology:** Gloves are constructed from a nonpermeable butyl rubber film. Butyl gloves exhibit high-permeation resistance to gas or water vapors. Ideal for use in ketones and esters.**Glove Description:** There are 5 models. All are 36 cm (14 in) long with various thickness. B074GI—7 mil.**Glove Application:** Submersion in water or any other type of liquid(s); fused munitions; explosive atmospheres; biological; and deep frozen media**Flame Resistance:** Not flame resistant**EOD Capability:** EOD compatible**CAPABILITIES****CAs Protected Against:** NFPA 1994 Class 1 CA permeation resistance (100 g/m²). Test results are thickness dependent. North Butyl gloves regularly pass agent testing in accordance with MIL-STD-282 section 209 for HD and MIL-STD-282 section 208 for GB.

25 mil thick passes 360 min for HD and 450 min for GB

14 mil thick passes 210 min. for HD and 450 min for GB

7 mil thick passes 75 min for HD and 360 min for GB

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—Biological Threats)**TIMs Protected Against:** See chemical duration results**Duration of Protection:** 6 h

Acrylonitrile—100 %—>8 h—N/D—ASTM F739

Allylamine—100 %—3.9 h—7 mg/m²/s—ASTM F739Carbon disulfide—100 %—3 min—98.4 mg/m²/s—ASTM F739

Chloroacetonitrile—100 %—>8 h—N/D—ASTM F739

Ethylene dibromide—100 %—3.3 h—6.0 mg/m²/s—ASTM F739

Formaldehyde—37 %—>16 h—N/D—ASTM F739

Methyl isocyanate—100 %—1.1 h—9 mg/m²/s—ASTM F730**Physical Resistance and Durability:**

- **Cut Resistance (ASTM F 1790):** Not specified

- **Puncture Resistance (ASTM F 1342):** ANSI/ISEA 105—B254GI Level 2, B174 Level 2, B144GI Level 1, B224GI Level 2
- **Abrasion Resistance (ASTM D 3883):** ANSI/ISEA 105—B254GI Level 3, B174 Level 3, B144GI Level 3, B224GI Level 3
- **Resistance (Other):** The material degrades when exposed to petroleum, oil, and lubricants. Material is antistatic. Butyl gloves exhibit high permeation resistance to gas or water vapors. Ideal for use in ketones and esters.
- **Environmental Conditions (ASTM D 747):** Glove has not been tested
- **Independent Cold Temperature Testing:** North butyl gloves pass ASTM D1053 and Mil-DLT-43976D for cold flex

HUMAN FACTORS

Grip Texture: Wet/dry grip

Comfort (ASTM F 1154): Not tested

Dexterity (ASTM F 2010): Not specified

Thickness: Thickness measured on the back of hand: B074GI—178 μ (7 mil)

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove can be worn directly over skin.

Ease of Entry: A liner is available that conforms to the shape of the glove

Gauntlet Length: 15.24 cm (6 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** 5 yr recommended based on history. Gloves should be visually inspected before use.
- **Shelf Life (Out of Package):** >1 yr based on history

Storage Conditions: 10 °C to 29 °C (50 °F to 85 °F); 20 % to 80 % rh

Sizes Available: X-small, small, medium, large, and X-large

Health Hazards and Safety:

- **Latex:** No latex
- **Allergens:** No other allergens
- **MSDS:** MSDS is available

Warranty: Not specified

GENERAL**Ansell Gold Knit Kevlar®****Model:** 70-225

Ansell Healthcare
200 Schulz Drive
Red Bank, New Jersey 07701
Jamie Ashworth
800-800-0444(Tel)
585-223-2887 (Tel)
800-800-0445 (Fax)
jashworth@ansell.com

<http://www.ansellpro.com>

RKB

Unit Cost: \$10



OSHA EPA Level: Class 1/Level A

Certification Status: NFPA 1994 (2001 Edition) Class 1 with STEPO, Fully Encapsulating Coverall Ensemble (Saint-Gobain Performance Plastics, Inc.)

NFPA 1994 (2001 Edition) Class 2 with ITAP, Nonencapsulating Ensemble (Saint-Gobain Performance Plastics, Inc.)

NFPA 1992 (2005 Edition) with ITAP (Improved Toxicological Agent Protective Ensemble) (Saint-Gobain Performance Plastics, Inc.)

NFPA Comments: Not specified

Independent Testing: Not specified

Other Certifications: Not specified

Test Dates: Not specified

Test Conducted: Not specified

Glove Description: Not specified

Material Technology: Not specified

Flame Resistance: Flame resistant

Glove Application: Not specified

EOD Capability: Not specified

CAPABILITIES

CAs Protected Against: Not specified

BAs Protected Against: Not specified

TIMs Protected Against: Not specified

Duration of Protection: Not specified

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Not specified
- **Puncture Resistance (ASTM F 1342):** Not specified
- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** Not specified
- **Environmental Conditions (ASTM D 747):** Not specified
- **Independent Cold Temperature Testing:** Not specified

HUMAN FACTORS

Grip Texture: Not specified

Comfort (ASTM F 1154): Not specified

Dexterity (ASTM F 2010): Not specified

Thickness: Not specified

Don/Doff: Not specified

Gauntlet Length: Not specified

Ease of Entry: Not specified

Glove/Suit Interface: Not specified

Glove Length: Not specified

LOGISTICS

TDP (Technical Data Package): Not specified

Storage Conditions: Not specified

Shelf Life (Packaged): Not specified

Shelf Life (Out of Package): Not specified

Sizes Available: Not specified

Warranty: Not specified

Health Hazards and Safety:

- **Latex:** Not specified
- **Allergens:** Not specified
- **MSDS:** Not specified

GENERAL**Ansell Edmont Kevlar®****Model:** K2300-12

Ansell Healthcare
 200 Schulz Drive
 Red Bank, New Jersey 07701
 Jamie Ashworth
 800-800-0444(Tel)
 585-223-2887 (Tel)
 800-800-0445 (Fax)
 jashworth@ansell.com

<http://www.ansellpro.com>

RKB

Unit Cost: \$10



OSHA EPA Level: Class 1/Level A

Certification Status: NFPA 1994 (2001 Edition) Class 1 with DuPont Tychem TK (DuPont)

NFPA 1991 (2005 Edition) with Commander® EX Brigade (DuPont)

NFPA 1991 (2005 Edition) with Tychem® Responder (DuPont)

NFPA 1991 (2005 Edition) with Tychem® Reflector (DuPont)

NFPA Comments: Not specified

Other Certifications: Not specified

Test Conducted: Not specified

Independent Testing: Not specified

Material Technology: Not specified

Test Dates: Not specified

Glove Application: Not specified

Glove Description: Not specified

EOD Capability: Not specified

Flame Resistance: Flame resistant

CAPABILITIES

CAs Protected Against: Not specified

BAs Protected Against: Not specified

TIMs Protected Against: Not specified

Duration of Protection: Not specified

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Not specified
- **Puncture Resistance (ASTM F 1342):** Not specified
- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** Not specified
- **Environmental Conditions (ASTM D 747):** Not specified
- **Independent Cold Temperature Testing:** Not specified

HUMAN FACTORS

Grip Texture: Not specified

Comfort (ASTM F 1154): Not specified

Dexterity (ASTM F 2010): Not specified

Thickness: Not specified

Don/Doff: Not specified

Ease of Entry: Not specified

Gauntlet Length: Not specified

Glove Length: Not specified

Glove/Suit Interface: Not specified

LOGISTICS

TDP (Technical Data Package): Not specified

Storage Conditions: Not specified

Shelf Life (Packaged): Not specified

Shelf Life (Out of Package): Not specified

Sizes Available: Not specified

Warranty: Not specified

Health Hazards and Safety:

- **Latex:** Not specified
- **Allergens:** Not specified
- **MSDS:** Not specified

GENERAL

NBC Vapor Protective Gloves

Model: D10434

Gentex Lifetex Products
324 Main Street
Simpson, Pennsylvania 18407
Steve Zawislak
570-282-8336 (Tel)
szawislak@gentexcorp.com

<http://www.gentexcorp.com/Lifetex/CPgloves.htm>
RKB



Unit Cost: Not specified

OSHA EPA Level: Not specified

Certification Status: Not specified

NFPA Comments: Not specified

Other Certifications: Not specified

Independent Testing: Not specified

Test Conducted: Not specified

Test Dates: Not specified

Material Technology: The gloves are made from a laminate of nylon inner layer, a compressed foam impregnated with activated carbon, and an outer layer of Nomex/PBI® tricot knit, Lifetex® CD3030. The resulting laminate is thin, comfortable, breathable and has outstanding chemical protective properties. Lifetex is a registered trademark of Gentex Corporation. The Lifetex CD-2000 Series fabrics filter out dangerous chemical vapors while maintaining breathability and comfort. These protective fabrics feature a broad range of laminated textiles which, when manufactured into a suitably designed garment, provide outstanding protection in the most hazardous environments. The Lifetex CD-2000 Series is designed around the highly efficient filtration properties of carbonaceous adsorbent spheres. Unlike activated carbons, which originated from pitch or coconut shells, our adsorbent spheres have an engineered polymer resin base. This polymer then undergoes a controlled carbonization and activation process, resulting in a sphere that is very uniform in size and performance. This process can also be used to tailor the affinity of the particular adsorbent to a known threat or environmental conditions. The spheres balance a large volume of micropores, where actual adsorption occurs. A certain level of macro and meso pores facilitate access to the microporous structure and increase efficiency. The selection of the textile matrix to form the protective laminate depends solely on the properties desired in the final fabric. The requirements of the garment will control the selection of the textile substrate onto which the spheres are laminated.

Gentex offers a chemical protective glove made with our CD3030. Three-layer laminate, a nylon tricot knit fabric forms the skin-side layer protecting an inner layer, impregnated with activated carbon, which is then protected on the outside by a PBI /Nomex tricot knit.

Glove Description: Chemical protective gloves provide a breathable, comfortable alternative to the system currently in use for pilots. The system replaces the cotton inner glove, the butyl glove, and the Nomex flight glove with a single glove, providing the wearer with much more comfort with prolonged wear. Standard fabric color is sage green.

Glove Application: The CD Vapor Protective Gloves provide a breathable, comfortable alternative to the system currently in use for pilots. This system replaces the cotton inner glove, the butyl glove and the Nomex® flight glove with a single glove, making the wearer much more comfortable. The technology is similar to what is being used for protective clothing systems throughout the world. The gloves were originally developed to a NATO specification as a vapor protective pilots glove and are currently used by the German and Norwegian Air Forces. Recently they were also adopted by the U.S. Department of Energy for use by their tactical teams (SWAT) that required a highly tactile glove. The gloves have been in use with the German and Norwegian Air Forces, and are being evaluated by several other countries throughout the world. They have also been adopted by the U.S. Department of Energy.

Flame Resistance: Flame resistant

EOD Capability: Not specified

References: To date, domestic agencies, such as the U.S. Department of Energy, and foreign militaries, including the German and Norwegian Air Forces, have purchased gloves for use by their personnel

CAPABILITIES

CAs Protected Against: CRDC-SP-84010 Method 2.1 GD vapor/vapor (6 h exposure <1.25 µg/cm² at concentration of 10 µg/L)

CDRC-SP-84010 Method 2.1 HD vapor/vapor (6 h exposure <4 µg/cm² at concentration of 20 µg/L)

BAs Protected Against: Not specified

TIMs Protected Against: Not specified

Duration of Protection: GD vapor/vapor—6 h exposure <1.25 µg/cm² at concentration of 10 µg/L

HD vapor/vapor—6 h exposure <4 µg/cm² at concentration of 20 µg/L

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Not specified
- **Puncture Resistance (ASTM F 1342):** Not specified
- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** Break Strength—ASTM D5034 (warp—33.7 lb min; fill—33.7 lb min)
- **Air Permeability—ASTM D737** (13.0 ft³/ft² • minute min)
- **Thickness—ASTM D1777** (0.045 in max)
- **Environmental Conditions (ASTM D 747):** Not specified
- **Independent Cold Temperature Testing:** Not specified

HUMAN FACTORS

Grip Texture: Not specified

Comfort (ASTM F 1154): Not specified

Dexterity (ASTM F 2010): Lower heat stress, higher air permeability, ability to withstand repeated laundering, resistance to degradation by perspiration, and excellent chemical agent protection (compared to more traditional chemical protective filtration fabrics)

Thickness: 1.143 mm (45 mil)

Don/Dooff: Not specified

Ease of Entry: Not specified

Gauntlet Length: Not specified

Glove Length: Not specified

Glove/Suit Interface: Not specified

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** Not specified
- **Shelf Life (Out of Package):** Not specified

Storage Conditions: Not specified

Sizes Available: The gloves are made in standard sizes 7 through 12 in full sizes

Health Hazards and Safety:

- **Latex:** Not specified
- **Allergens:** Not specified
- **MSDS:** Not specified

Warranty: Not specified

GENERAL**JOMAC Kevlar® Plus****Model:** 1804NBC

JOMAC Canada
 10 Bachelder Street
 Stanstead (Quebec)
 JOB 3E2
 800-567-2765 (Tel)
 819-876-7531 Tel)
 819-876-5361 (Fax)
 Sclowery@wellslamont.com

<http://www.jomaccanada.com/eng/product/cut04.html>

Unit Cost: \$6.50**OSHA EPA Level:** Class 1/Level A**Certification Status:** NFPA 1994 (2001 Edition) Class 2 with DTAPS® (Geomet Technologies, LLC.)**NFPA Comments:** Not specified**Other Certifications:** Not specified**Independent Testing:** Not specified**Test Conducted:** Not specified**Test Dates:** Not specified**Glove Application:** Not specified**Flame Resistance:** Flame resistant

Material Technology: Kevlar® Plus offers 20 % more cut resistance than standard Kevlar® brand fiber yet still features the same heat and flame resistance. Kevlar® properties: high-tensile strength, low density, resistance to corrosion, and cut protection without sacrificing comfort and dexterity.

Glove Description: Specially designed antimicrobial gloves. MicroSafe® fiber offers an additional layer of protection from bacterial and fungal growth. MicroSafe® fiber is nontoxic and lasts the life of the glove, even after repeated washings. Gloves should continue to be washed and sanitized as part of your standard glove maintenance program.

EOD Capability: Not specified**CAPABILITIES****CAs Protected Against:** Not specified**BAs Protected Against:** Not specified**TIMs Protected Against:** Not specified**Duration of Protection:** Not specified**Physical Resistance and Durability:**

- **Cut Resistance (ASTM F 1790):** ASTM 1790-97. Cut-resistant gloves are extremely cut-resistant but not cut-proof.
- **Puncture Resistance (ASTM F 1342):** Not specified
- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** Not specified
- **Environmental Conditions (ASTM D 747):** Not specified
- **Independent Cold Temperature Testing:** Not specified

HUMAN FACTORS**Grip Texture:** Not specified**Comfort (ASTM F 1154):** Not specified**Dexterity (ASTM F 2010):** Ambidextrous**Thickness:** 457 μ (>18 mil)**Don/Doff:** Not specified**Ease of Entry:** Not specified**Gauntlet Length:** Continuous cuff**Glove Length:** Not specified**Glove/Suit Interface:** Not specified**LOGISTICS****TDP (Technical Data Package):** Not specified**Storage Conditions:** Not specified**Shelf Life (Packaged):** Not specified**Shelf Life (Out of Package):** Not specified**Sizes Available:** X-small, small, medium, and large**Warranty:** Not specified**Health Hazards and Safety:**

- **Latex:** No latex
- **Allergens:** MicroSafe® fiber is nontoxic and lasts the life of the glove
- **MSDS:** Not specified

GENERAL

Kevlar® Glove

Model: KV18AJTC

Perfect Fit Glove
85 Innsbruck Drive
Buffalo, NY 14227
800-245-6837 (Tel)
716-668-2000 (Tel)
716-668-3224 (Fax)
perfectfitglove@perfectfitglove.com

<http://www.perfectfitglove.com/contact/default.asp>

Unit Cost: \$10.50



OSHA EPA Level: Class 1/Level A

Certification Status: NFPA 1991 (2005 Edition) Class 1 with Trellechem® VPS VP1 (Trelleborg Protective Products AB)
NFPA 1991 (2005 Edition) Class 1 with Trellechem® HPS VP1 (Trelleborg Protective Products AB)
NFPA 1994 (2001 Edition) Class 1 with Trellechem® VPS VP1 (Trelleborg Protective Products AB)

NFPA Comments: Not specified

Other Certifications: Not specified

Independent Testing: Not specified

Test Conducted: Not specified

Test Dates: Not specified

Material Technology: Not specified

EOD Capability: Not specified

Glove Description: Tuff-Knit KV coated and uncoated seamless knit gloves of 100 % Kevlar® brand fiber. Used to make bullet-proof vests, Kevlar® brand fiber is five times stronger than steel on an equal weight basis and has a high-tensile strength that protects hands during hazardous applications. Given comparative job stresses, gloves made of Kevlar® brand fiber have been proven to last 3 to 6 times longer than cotton gloves. Seamless construction eliminates tearing or splitting along seams. By eliminating seams that can chafe or constrict movement, Tuff-Knit KV™ gloves with Kevlar brand fiber provide an excellent fit, better breathability and superior comfort for greater productivity and less hand fatigue.

Glove Application: KV18A-100 Standard weight 100 % Kevlar®

Flame Resistance: Kevlar® brand fiber will not support a flame and can withstand temperatures up to 482 °C (900 °F) without breaking down

CAPABILITIES

CAs Protected Against: Not specified

BAs Protected Against: Not specified

TIMs Protected Against: Not specified

Duration of Protection: Not specified

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Excellent cut and slash resistance
- **Puncture Resistance (ASTM F 1342):** Not specified
- **Abrasion Resistance (ASTM D 3883):** Not specified

- **Resistance (Other):** Superior durability and easily laundered
- **Environmental Conditions (ASTM D 747):** Not specified
- **Independent Cold Temperature Testing:** Not specified

HUMAN FACTORS

Grip Texture: Not specified

Dexterity (ASTM F 2010): Not specified

Thickness: Not specified

Don/Doff: Not specified

Ease of Entry: Not specified

Gauntlet Length: Not specified

Glove Length: Not specified

Glove/Suit Interface: Not specified

Comfort (ASTM F 1154): Seamless comfort for extended wear

LOGISTICS

TDP (Technical Data Package): Not specified

Storage Conditions: Not specified

Shelf Life (Packaged): Not specified

Shelf Life (Out of Package): Not specified

Sizes Available: Not specified

Warranty: Not specified

Health Hazards and Safety:

- **Latex:** Not specified

- **Allergens:** Not specified
- **MSDS:** Not specified

GENERAL***ONEGlove*****Model:** 22402M

Saint-Gobain Corporation
701 Daniel Webster Highway
Merrimack, New Hampshire 03054
Robert T. Currier
603-424-9000 ext. 2306 (Tel)
603-424-9044 (Fax)
robert.t.currier@saint-gobain.com

<http://www.oneglove.com>
RKB



Unit Cost: \$57 to \$65—depending on volume when purchased directly from Saint-Gobain

OSHA EPA Level: Class 1/Level A, Class 2, and Class 3

Certification Status: SEI—NFPA 1991 Standard on Vapor Protective Ensembles for Hazardous Materials Emergencies (2005 Edition)—VPS-SGP-04

SEI—NFPA 1992 Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies, 2005 Edition—LPS SGP 02

SEI—NFPA 1994 Standard on Protective Ensembles for Chemical/Biological Terrorism Incidents (2001 Edition)—CBT SGP 03, CBT SGP 04, CBT SGP 05

NFPA Comments: NFPA 1991: VPS-SGP-04—June 15, 2005

NFPA 1994 Class 1: CBT SGP 03—June 9, 2005

NFPA 1994 Class 2: CBT SGP 04—June 9, 2005

NFPA 1994 Class 3: CBT SGP 05—June 9, 2005

NFPA 1992: LPS SGP-02—June 9, 2005

Availability: Manufactured on demand. ONEGlove is supplied 12 pair/box. Custom requirements made to our soon to be certified base glove are entertained. For large orders please allow 2 wk for delivery initiation.

Other Certifications: SEI—NFPA 1971 testing is completed and passed. We are waiting certification paper work.

Independent Testing: DuPont THERMO Man

Test Conducted: Flash Fire

Test Dates: March 2005, and April 14, April 15, and April 16, 2005

Material Technology: ONEGlove is a single glove with a KEVLAR® outer shell, a PTFE barrier film, and a NOMEX® inner liner, which may interface with all known suit ensembles for a gas tight seal. The outer Kevlar layer has a water resistant coating for additional water holdout. ONEGlove is made completely of U.S. made nonburning materials

Glove Description: ONEGlove is a revolutionary patent pending, high-dexterity protective glove, designed for maximum protection, providing Chem/Bio, fire, cut, and puncture resistance. ONEGlove is designed to provide wrist protection with its extended gauntlet. It is extremely light and exceeds the most stringent requirements for cut, puncture, fire and chemical protection. Cut and puncture exceed all NFPA 1991, 1992, 1994 Class 1, 2, and 3, NFPA 1971, and NFPA 1999. (TPP) Thermal Protection Performance exceeds the NFPA 1971 standard. ONEGlove may be washed when dirty.

Glove Application: Flammable or flash fire environment; submersion in water or any other type of liquid(s); fused munitions; explosive atmospheres; radiation; and biological. Cryogenic conditions; liquefied gas conditions; deep frozen media; blood-borne pathogens; viral penetration; industrial chemicals TICs, TIMs, and POLs. Other solvents, oils and lubricants; flash fire; and liquefied gases. ONEGlove has application where there exists chemical, biological (bacteria and viral), cut, puncture, heat, cold, and flame hazards.

Flame Resistance: Flame resistant—ONEGlove is made of Kevlar outer, PTFE barrier, and Nomex inner

EOD Capability: Not EOD compatible—glove will require modification to address this challenge

References: New product

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 1 and NFPA 1991. CB agents including warfare agents

BAs Protected Against: NFPA 1991/NFPA 1994 by providing “systems level” aerosol threat protection. BAs including warfare agents.

TIMs Protected Against: Meets 1994, 1991, and 1992 plus additional chemical threats; see chemical duration results

Duration of Protection: Please reference chemical breakthrough times

Acrylonitrile—99.99 %—>480 min—<0.01 permeation rate—ASTM F 739

Ammonia—99.99 %—>480 min—<0.01 permeation rate—ASTM F 739

Carbon disulfide—98 %—>480 min—<0.02 permeation rate—ASTM F 739

Chlorine—99.5 %—>480 min—<0.01 permeation rate—ASTM F 739

Ethylene oxide—99 %—>480 min—<0.01 permeation rate—ASTM F 739

Hydrogen chloride—99 %—>480 min—<0.01 permeation rate—ASTM F 739

Hydrogen cyanide—as pure as possible—>60 min (testing stopped @ 60 min)—<0.09 permeation rate—ASTM F 739

Phosgene (CG)—as pure as possible—>60 min (testing stopped @ 60 min)—<0.003 permeation rate—ASTM F 739

Sulfuric acid, concentrated—98.5 %—>480 min—<0.01 permeation rate—ASTM F 739

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Applied load >50 N (11.2 lbf) at 1000 g (35.27 oz)
- **Puncture Resistance (ASTM F 1342):** Average value: >14.69 kg (32.4 lb)
- **Abrasion Resistance (ASTM D 3883):** The glove has not been tested
- **Resistance (Other):** The material is tear, cut, puncture, and abrasion resistant. The material does not degrade when exposed to petroleum, oil, and lubricants.
- **Environmental Conditions (ASTM D 747):** 0.0015 N/m (0.0001 lbf/ft) with moment weight—0.05 kg (0.11 lb)
- **Independent Cold Temperature Testing:** Glove has not been tested. ONEGlove is made from components that will withstand cryogenic temperatures.

HUMAN FACTORS

Grip Texture: As tested in NFPA 1971, weight pulling capacity was >90 %

Comfort (ASTM F 1154): This test is for ensembles, however, ONEGlove is very comfortable on the hand with an inner liner. It is also very light in weight and has a waterproof coating applied to the outer surface.

Dexterity (ASTM F 2010): <200 %

Thickness: Nominal 2.03 mm (80 mil)

Don/Doff: 0 s to 30 s to don/doff. Assistance not needed. Glove is integrated as part of the ensemble/garment and is removable (with instructions). Glove can be worn directly over skin. ONEGlove is made from inert materials and is not skin sensitive.

Ease of Entry: All “layers” of ONEGlove are attached and cannot be separated

Gauntlet Length: 15.24 cm (6 in)

Glove Length: 35.56 cm (14 in)

Glove/Suit Interface: Interface between the suit and glove. Gauntlet is compatible for interfacing with the suit.

LOGISTICS

TDP (Technical Data Package): Not available

Shelf Life:

- **Shelf Life (Packaged):** 1 yr to 5 yr. Based on shelf life of component materials making up the glove. This is a new product, and we suggest a semi-annual leak test until we develop a shelf life history. The PTFE barrier material has a very long shelf life.
- **Shelf Life (Out of Package):** >1 yr. The outer Kevlar when exposed to sun light will darken but this does not affect serviceability. As this is a new product, shelf life will be determined with time.

Storage Conditions: As a minimum -4 °C to 49 °C (25 °F to 120 °F); 20 % to 80 % rh

Sizes Available: X-small, small, medium, large, X-large, and XX-large. Sizes meet 96 % of the military population. Other sizes may be made available upon request and volume.

Health Hazards and Safety:

- **Latex:** Made from inert materials
- **Allergens:** Made from Kevlar, Nomex, and PTFE
- **MSDS:** For Kevlar, Nomex, and PTFE

Warranty: To be determined—Standard Saint-Gobain warranty/disclaimer

GENERAL***Shelby® Proximity Glove with Steamblock*****Model:** 5200L

Shelby Specialty Gloves
 5321 East Shelby Drive
 Memphis, Tennessee 38118
 901-360-8928 (Tel)
 800-888-3598 (Tel)
 901-362-9127 (Fax)

<http://www.shelbyglove.com/fire/wildland-proximity.html>

**Unit Cost:** \$101.99 Pair**OSHA EPA Level:** Not specified**Certification Status:** Compliant to NFPA 1976 (2000 Edition)**NFPA Comments:** Not specified**Availability:** Available for immediate delivery**Other Certifications:** Not specified**Independent Testing:** Not specified**Test Conducted:** Not specified**Test Dates:** Not specified**Material Technology:** Outer shell—7 oz (aluminized PBI/Kevlar Knit 0.063 cm (0.025 in) thick). Flexible vent pleat on back of hand.

Protective barrier—Gore (PTFE) RT7100.

Glove barrier fabric—combined (laminated) to the thermal liner. The breathable barrier/thermal liner system is individually graded and produced in as many sizes as glove sizes. The barrier/thermal liner systems are sized proportional to human hand sizes.

Wristlet—nomex 10.5 oz/yd, double ply.

Glove Description: Glove is a gunn cut pattern with wing thumb construction. Front, back and all sides of the glove and fingers are of Aluminized PBI/Kevlar Knit and have grip patches on palm, thumb, and all fingers. Back of the glove is oversized with expandable vent pleat, allowing for more room and insulative air across back of hand. Glove body extends 1½ in circumferentially beyond the wrist crease. Glove liner or liner/barrier system is permanently sewn in at fingertips. No glue is used to attach liner/barrier system inside glove.**Glove Application:** Proximity glove with aluminized PBI® /KEVLAR®, Firewall® Steamblock®, w/wristlet, GORE™ RT7100 Glove Barrier Fabric, NFPA Compliant, SEI Certified**Flame Resistance:** Firewall Steamblock® Insulative pad shall be a fire-retardant silicone foam elastomer with an integral skin on the top and bottom surfaces and be attached in the side seams of the glove. The Firewall Steamblock® Insulative pad shall extend on the back of the glove from the bottom/wrist of the glove to approximately ¼ in below the crotch of the fingers. Glove also features Shelby's Firewall® Steamblock® insulative pad on the back of the hand. This Firewall® Steamblock® offers superior protection to the back of the hand against steam and heat.**EOD Capability:** Not specified**CAPABILITIES****CAs Protected Against:** Not specified**BAs Protected Against:** Bloodborne pathogen-resistant barrier**TIMs Protected Against:** Not specified**Duration of Protection:** Not specified

Not specified

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Sewn with high-burst strength Kevlar 30/5 lock stitch, 8 stiches to 10 stitches per in
- **Puncture Resistance (ASTM F 1342):** Not specified

- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** Not specified
- **Environmental Conditions (ASTM D 747):** Not specified
- **Independent Cold Temperature Testing:** Not specified

HUMAN FACTORS

Grip Texture: Special gripping surfaces applied to the palm. Streamlined for less bulk, greater fingertip control. Split cowhide grip patches (on palm, thumb, and fingers).

Comfort (ASTM F 1154): Not specified

Dexterity (ASTM F 2010): Not specified

Thickness: Nominal 2.03 mm (80 mil)

Don/Doff: Wrist pull: 7.6 cm x 8.9 cm (3 in x 3 ½ in) round leather pull, sewn to wristlet and glove body

Ease of Entry: Glove has integral liner or does not require a liner

Gauntlet Length: Greater than 10 cm (4 in) above the wrist

Glove Length: Not specified

Glove/Suit Interface: Not specified

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** Between 6 yr and 10 yr
- **Shelf Life (Out of Package):** Not specified

Storage Conditions: Not specified

Sizes Available: Medium, large, and X-large

Health Hazards and Safety:

- **Latex:** Not specified
- **Allergens:** Not specified
- **MSDS:** Not specified

Warranty: Not specified

GENERAL

Total Fire Group Proximity Gloves**Model:** GL-BPR-RWA

Total Fire Group
 #1 Innovation Court
 P.O. Box 13616
 Dayton, OH 45413-0616
 800-688-6148 (Tel)
 937-264-2662 (Tel)
 937-264-2677 (Fax)
 info@totalfiregroup.com

www.totalfiregroup.com
 http://morningpride.com

Unit Cost: \$62**OSHA EPA Level:** Not specified**Certification Status:** NFPA 1976 (2000 Edition)

NFPA Comments: Morning Pride certified glove models are tested to NFPA performance requirements (and other standards where applicable) by Underwriters Laboratories®

Availability: Inventory depth allows Morning Pride to fill most orders very quickly. Thousands of gloves are stocked to ensure quick turnaround and use our state-of-the-art garment cutting and sewing facility to support some of our unique products.

Other Certifications: Not specified**Independent Testing:** Not specified**Test Conducted:** Not specified**Test Dates:** Not specified

Material Technology: Three-dimensional type glove pattern used in high-end sporting and dress gloves (including a front, a back, and sides of the fingers). The 16.5 cm (6.5 in) gauntlet is made from Pbi®/Kevlar® outer shell material and completely lined with CROSSTECH® moisture barrier, with its own band of sewn on 5.1 cm (2 in) lime Scotchlite®. There is a separate, extra layer of thermal liner for superior insulation at the back of the hand in the carpal area, and Flex-Tucks at the finger joints to increase dexterity.

Glove Description: Morning Pride's NFPA Certified gloves offer patented, never-detach stitched construction technology guaranteed against liner detachment. With the Never Detach technology (patented) stitch all layers of the glove (waterproof insert, outer shell, and thermal liner) together and then use our specialized technology and equipment to go back in and reseal over the securing stitching lines.

Glove Application: Proximity gloves are the first three-dimensional pattern gloves offered to the fire service. Structural, wildland, and Technical Rescue/USAR products.

Flame Resistance: Flame resistant**EOD Capability:** Not specified

CAPABILITIES

CAs Protected Against: Not specified**BAs Protected Against:** Not specified**TIMs Protected Against:** Not specified**Duration of Protection:** Not specified

Not specified

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Not specified
- **Puncture Resistance (ASTM F 1342):** Not specified
- **Abrasion Resistance (ASTM D 3883):** Not specified
- **Resistance (Other):** Gauntlet style gloves are available in both BPR and HNO models
- **Environmental Conditions (ASTM D 747):** Not specified
- **Independent Cold Temperature Testing:** Not specified

HUMAN FACTORS

Grip Texture: Not specified

Comfort (ASTM F 1154): Not specified

Dexterity (ASTM F 2010): Not specified

Thickness: Not specified

Don/Doff: Not specified

Ease of Entry: Not specified

Gauntlet Length: 16.5 cm (6.5 in)

Glove Length: Not specified

Glove/Suit Interface: Originally developed with the input of the Houston Fire Department, and later adapted for the U.S. Navy, this style offers a glove-to-coat cuff interface like no other product. Designed to fit completely over the end of the sleeve and cinch down with a take-up strap, there will be no thermal gapping at the wrist ever when wearing this product.

LOGISTICS

TDP (Technical Data Package): Not specified

Shelf Life:

- **Shelf Life (Packaged):** Not specified
- **Shelf Life (Out of Package):** Not specified

Storage Conditions: Not specified

Sizes Available: Not specified

Health Hazards and Safety:

- **Latex:** Not specified
- **Allergens:** Not specified
- **MSDS:** Not specified

Warranty: Manufacturer shall guarantee the liner and moisture barrier of the glove not to detach or pull out for the useful life of the glove outer shell, and to be free from defects in material and workmanship for the serviceable life of the product

GENERAL

GORE™ Chempak® Ultra Barrier Glove System

Model: G9492-C2-OGN

W. L. Gore & Associates, Inc.
 105 Vieve's Way
 Elkton, MD 21921
 Debbie Fitzgerald
 800-431-4673 (Tel)
 410-506-5486 (Fax)
 dfitzger@wlgore.com

http://www.goremilitary.com/tech_05_mil.html#



Unit Cost: \$79/pair for orders >144 pair; \$89/pair for orders <144 pair (calendar year 2006)

OSHA EPA Level: Class 1, Class 2, and Class 3

Certification Status: NFPA 1992 (2005 Edition)—certified stand-alone glove
 NFPA 1994 (2001 Edition) Class 2 with Tactix Brand® MT-94™ (Lion Apparel)—October 19, 2005
 NFPA 1992 (2005 Edition) certified with Tactix Brand® MT-94™ (Lion Apparel)—October 19, 2005

NFPA Comments: Expected NFPA 1994 certification, August 2006 (Interspiro, Inc.) with Improved Chemical Protective Ensemble (ICE)

Availability: Manufactured on demand; 12 wk lead time, no minimum order required, discounts available for large volume orders

Other Certifications: Not specified

Independent Testing: SEI (Safety Equipment Institute), September 2005

Test Conducted: NFPA 1994 Class 2 and NFPA 1992

Test Dates: September 2005

Material Technology: Glove liner is a thin, lightweight impermeable barrier film laminated to an outer textile. The overglove is a Nomex® flyers-style glove. The glove liner is attached to the garment with an interface system that resists vapor ingress. For example, the TACTIX® MT94 garment interface includes a removable, mechanical ring system.

Glove Description: A highly dexterous and tactile, durably protective CB glove system for responders that meet NFPA performance requirements. Tactility—ability to operate electronics, weapons, etc. Dexterity—operate rescue tools, ropes, etc.

Glove Application: Flammable or flash fire environment, submersion in water or any other type of liquid(s), flammable or flash fire environment and, and biological applications

Flame Resistance: Certified to NFPA 1992 Flash Fire Option

EOD Capability: Glove does not have the ability to be used with an EOD

References: The G9492 glove is similar to JSLIST Block 1 military glove, 3 yr in use

CAPABILITIES

CAs Protected Against: NFPA 1994 Class 2 CA permeation resistance (10 g/m², closed top); also NFPA 1994 Class 3 CA permeation resistance (10 g/m², open top)

BAs Protected Against: Meets NFPA 1994 ASTM F 1671 (Liquid Penetration Resistance—Biological Threats)

TIMs Protected Against: Meets NFPA 1992/modified ASTM F 1001 battery of 7 chemicals (penetration resistance only); Meets NFPA 1994 Class 2

Duration of Protection: NFPA 1992 tests for 1 h liquid penetration resistance, NFPA 1994 Class 2 tests for 6 h minimum breakthrough times on a variety of chemical and CB agents. See NFPA standards for more information.

24 h protection once contaminated by CA vapors, aerosols, and small droplets. Protection not compromised by exposure to commonly encountered petroleum and hydrocarbon-based substances.

Physical Resistance and Durability:

- **Cut Resistance (ASTM F 1790):** Glove has been evaluated to the cut resistance test (ASTM F1790). Passes NFPA 1994 Class 2 requirements.

- **Puncture Resistance (ASTM F 1342):** Glove has been evaluated to the puncture resistance test (ASTM 1342). Passes NFPA 1994 Class 2 requirements.
- **Abrasion Resistance (ASTM D 3883):** Glove has not been evaluated to abrasion resistance (ASTM D3889) using the H-18 wheel and either 500 g or 1000 g weights
- **Resistance (Other):** The material does not degrade when exposed to petroleum, oil, and lubricants. Material is antistatic.
- **Environmental Conditions (ASTM D 747):** Glove passes NFPA 1994 Class 2 requirements for ASTM D747 (cold temperature performance)
- **Independent Cold Temperature Testing:** Glove has met independent cold temperature performance tests (NFPA 1994 Class 2 requirements)

HUMAN FACTORS

Grip Texture: Rounded fingertips to facilitate the manipulation of small items; wet/dry grip (NFPA 1994 Class 2 requirements)

Comfort (ASTM F 1154): Glove exceeded ASTM F1154 requirements

Dexterity (ASTM F 2010): Values from 128 % to 190 % were reported depending on size and test subject

Thickness: Not specified

Don/Doff: Glove is integrated as part of the ensemble/garment and is removable (with instructions). Glove can easily be turned inside out when pulled off for easy disposal. Glove can be worn directly over skin. Glove does not have to be taped. Assistance not needed for donning and/or doffing. Donning time 0 s to 30 s. A liner is available that conforms to the shape of the glove.

Ease of Entry: A liner is available that conforms to the shape of the glove

Gauntlet Length: 10 cm (4 in)

Glove Length: 15 in

Glove/Suit Interface: Gauntlet is compatible for interfacing with the suit. Each manufacturer uses proprietary interface system.

LOGISTICS

TDP (Technical Data Package): TDP is available

Shelf Life:

- **Shelf Life (Packaged):** 16 yr to 20 yr
- **Shelf Life (Out of Package):** >1 yr

Storage Conditions: -40 °F to 140 °F; no relative humidity restriction

Sizes Available: X-small, small, medium, large, and X-large

Health Hazards and Safety:

- **Latex:** Gloves do not contain latex
- **Allergens:** Gloves do not contain allergens
- **MSDS:** MSDS is available

Warranty: Not specified

APPENDIX J—APR DATA FIELDS

APPENDIX J—APR DATA FIELDS

Forty-six data fields were used to provide information relating to CBRN NIOSH approved APRs. The 46 data fields are comprised of data fields from the market survey vendor questionnaire requesting specifics about their CBRN APRs. All data fields from the market survey were developed using input from the emergency responder community. Because of the database limitations, several data fields on the vendor questionnaire were combined, but all the vendor-supplied information was entered into the database.

The data fields are grouped according to the following five parameters and the number of data fields in each parameter:

- General (14 data fields).
- Operational Capabilities (7 data fields).
- Design/Configuration (8 data fields).
- Human Factors (5 data fields).
- Logistics (12 data fields).

1.0 General

1.1 Product Information

Product information, including name, model, and/or stock number, is used to identify the APR. The stock and/or model number indicates the number(s) that are used to uniquely identify the equipment. It should include the stock identification or national stock number, if the APR has one.

1.2 Manufacturer

Manufacturer identifies the company that manufactured the APR (to include the name, address, telephone number(s), fax number, and point-of-contact).

1.3 Source

Source indicates where the APR information was obtained. Potential sources include past market surveys, internet websites, conferences, or commerce business daily announcements.

1.4 Information Last Updated

This data field provides the date when the manufacturer/vendor last updated the information.

1.5 NIOSH CBRN Certification

Special requirements for NIOSH CBRN APR certification include enhanced performance criteria for field of view, lens abrasion resistance, simulated carbon dioxide inhalation testing, canister gas life testing, fogging resistance, communications, resistance to CA penetration and

permeation, facepiece fit factor testing, and environmental conditioning. NIOSH CBRN APR requirements can be found in 42 CFR, Part 84, Subparts A, B, D, E, F and G; 42 CFR, Part 84, Subpart I, Paragraphs 84.110-12; and 42 CFR, Part 84, Subpart K, Paragraphs 84.170, 179, and 181.

1.6 NIOSH CBRN Certification Information

This data field provides the NIOSH CBRN certification number and the date of certification. This data field also indicates whether the APR has been submitted for certification.

1.7 Certification as an Assembly

The complete CBRN APR assembly must be composed of only those component parts that are part of the individual CBRN APR approval.

1.8 Other Certifications

Other certifications include applicable testing and certifications [include testing organization(s) and standard(s) such as mil-standards].

1.9 Independent Testing

Independent testing includes any test data obtained from sources regarding any part of the equipment (e.g., validation testing including materials and ensemble testing such as abrasion, tear, wear, burst, and permeation testing). Human factors testing results should be included as well (either quantitative or qualitative).

1.10 APR Description

This data field provides an overall description of the APR. Descriptions should include any features that make the APR unique.

1.11 APR Application

This data field identifies the areas where the APR is most likely to be used per vendor or manufacturer recommendation (e.g., tactical operations, crisis management, etc.), or those areas where the APR should not be used (i.e., in a flammable environment, etc.). This data field also indicates whether the manufacturer provides specific guidance and warnings that relate to the use of the respiratory equipment in atmospheres with less than 19.5 % oxygen concentration.

1.12 Unit and Component Cost (MSRP)

Unit and component costs include details on the complete respiratory system cost, as well as individual components (e.g., canisters, cartridges, etc.) costs.

1.13 Availability

Availability indicates the lead time for acquiring initial quantities of the APRs after the order has been placed, as well as repair and maintenance parts. Provide if the equipment is disposable or nondisposable.

1.14 References/User(s) of Product

*References/user(s) of product identifies organizations (i.e., military use, commercial applications, civil-service instrument, etc.) that are currently using the piece of equipment. This information may include the average number of units each client has in operation and the average number of years these units have been in use. **References must be verified with consent from the users before including the contact information.***

2.0 Operational Capabilities

2.1 Hazard/Threat Protection Categories

This data field references the protection capability of the respiratory equipment to protect against CBRN and TICs/TIMs.

2.2 Breathing Performance

Breathing performance includes both inhalation resistance and exhalation resistance. Resistance to airflow shall be measured in the facepiece of a NIOSH CBRN APR mounted on a test fixture with air flowing at a continuous rate of 85 L/min both before and after each gas service life bench test. Breathing performance will provide the measured values of both the inhalation resistance and the exhalation resistance of the APR.

- *Inhalation resistance—The NIOSH CBRN requirement for the as-received respirator is 50 mm H₂O. The number of filters needed to pull air through will influence the breathing performance of an APR.*
- *Exhalation resistance—The NIOSH CBRN standard requires an exhalation resistance of less than 20 mm H₂O at 85 L/min.*

2.3 Environmental Conditions

The NIOSH CBRN standard has minimum requirements for environmental testing. Different environments may affect the efficacy of the material. Some climates are extremely cold, some are hot and dry, others are hot and humid, and some can change from hot to cold, or cold to hot, within one mission. This data field provides specific guidance or recommendations related to the use of the respiratory equipment in high heat and humidity environments. It also indicates if the mask/canister has been subjected to the environmental tests referenced in the APR CBRN standards in the following list:

- Hot diurnal test method: Mil-Std-81°F; Method 501.4; Table 501.4-II.

- Cold constant test method: Mil-Std-81°F, Method 502.4.
- Humidity test method: Mil-Std-810E, 507.3; Method 507.3; Table 507.3-II.
- Vibration test method: Mil-Std-810F, 514.5.
- Drop test method: 3-ft drop onto bare concrete surface.
- Other conditions that may degrade canister performance (i.e., aerosol penetration, gas life, airflow resistance, etc.).

2.4 Chemical Specific Canister

*Chemical specific canister options consider the availability of NIOSH approved canisters for specific TICs such as chlorine. This field will also address what, if any, optional canisters are certified with a particular mask. This data field will provide information relating to testing that has been completed on the canister with specific challenge chemicals, including, **ammonia, chlorine, cyanogen chloride, cyclohexane, DMMP, formaldehyde, hydrogen cyanide, hydrogen sulfide, nitrogen dioxide, phosgene, phosphine, and sulfur dioxide**. Testing data will include **Canister ID, Challenge Concentration (mg/m³), T/RH (°C/%)**, **Breakthrough Concentration (mg/m³)**, **Flow Rate (L/min)**, and **Normalized Gas Life (min)**. Note: The challenge chemicals in bold represent the 10 test representative agents from the NIOSH APR CBRN standard.*

2.5 Canister Capacity Rating

The CBRN concept paper specifies minimum requirements for six different canister capacities: (1) 15 min, (2) 30 min, (3) 45 min, (4) 60 min, (5) 90 min, and (6) 120 min. The capacity times represent the minimum required gas life at the test conditions specified in the CBRN standard. The challenge concentrations used during certification testing are above IDLH. Since, APRs are only permitted for use in hazards below IDLH, the capacity categories do not represent actual use times, which will be dependent on the hazard type, hazard concentration, and environmental conditions. This criterion will compare the maximum capacities of the approved canisters for the various respirators. Multiple canisters would allow the user to tailor the canister capacity to the specific mission. This data field indicates the CBRN APR canister useful service life based on the canister capacity rating: Cap 1, 2, 3, 4, 5, or 6.

2.6 Canister Service Life

Canister service life considers the fielded life of the canister, or the life of a canister in a “cold zone.” The fielded life will be defined as the number of days after opening the packaging that the canister can be used before replacement is recommended, assuming that it has not been exposed to a contaminated environment. This data field indicates if the manufacturer provides any tools for estimating canister service life as well as the effects of temperature/relative humidity on canister performance.

2.7 Protection Factor

The protection factor addresses the ability of the respirator to effectively seal to the wearer. The information is based on the results of the Laboratory Respiratory Protection Level (LRPL) testing per the NIOSH test method. The CBRN standard contains minimum requirements for

LRPL. This test is performed with a panel of human subjects with a variety of facial sizes. The subjects don the mask and enter a chamber containing a corn oil aerosol challenge. The subjects perform a series of exercises while the in-mask aerosol concentration is measured permitting determination of the LRPL (Standard Test Procedure (STP) as prescribed in 42 CFR, Part 84, Subpart G, Section 84.63(a), (c), & (d); Federal Register, Volume 60, Number 110, June 8, 1995). This data field will include if the manufacturer has performed LRPL testing on the mask at the U.S. Army's Protection Factor Test Facility, and the percentage of test subjects that exceeded the LRPL minimum requirement of 2000.

3.0 Design/Configuration

3.1 Facepiece

Facepiece information includes the type of material used to make the faceblank, the type of visor (single lens or double lens) the facepiece has, and the overall visibility of the visor.

3.2 Faceblank Material

The faceblank material data field indicates the composition of the material that will touch the skin.

3.3 Visor

The visor data field indicates if the lens is a single or dual ocular lens, and provides the name of the material used to fabricate the visor. Other visor information includes the hardness or flexibility of the visor, infrared protection, and compatibility with other equipment, such as the availability or accommodation of optical inserts, head lamp attachments and communication devices, as well as whether the lens is made from antifogging material and is it scratch resistant.

3.4 Visibility

Visibility includes visual acuity and impact on the field of view (FOV) as a percentage of visibility that the user has while wearing a respirator. Visual acuity for a person with 20/20 vision, either corrected or uncorrected, should be at least 20/35 while looking through a lens; an expected FOV is at least 70 % while looking through a lens. The data field will also provide the visual field score (VFS) as determined using the NIOSH APR CBRN standard.¹

3.5 Facepiece Compatibility

This data field indicates the ability to use the APR facepiece with other types of respirators, such as a PAPR or SCBA. It also indicates whether the mask can be used for multiple platforms or if separate masks, even if identical, are required for each platform.

¹ NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0314

3.6 Interoperability with End User Equipment

This data field considers the number and types of equipment that can be used with the APR. Examples of end user equipment include head lamps and active communication equipment.

3.7 Canister Mount/Location

The canister mount is the location that the canister interfaces with the facepiece. The CBRN standard permits approval of two configurations: (1) facepiece mounted and (2) non-facepiece mounted (i.e., harness system with hose connecting to mask). Canister mounting location could affect comfort, vision, or hinder communication.

3.8 Canister Configuration

This data field provides information regarding canister dimensions, canister weight, canister shape, canister mechanical connection, and includes information relating to the gasket mechanical connector.

4.0 Human Factors

4.1 Communications

The NIOSH CBRN standard has a minimum requirement for speech intelligibility. All standard models have passive communication (without the aid of electronic communication or extended devices). This data field indicates the availability of a voice amplifier to enhance communication. Any accessory must be included on the CBRN approval for use.

4.2 Hydration capability

NIOSH CBRN standard permits approval of respirators equipped with hydration systems. The hydration system can be used during training exercises but is not permitted for use in the hot zone. Although hydration capability is considered an enhanced capability, factors that affect hydration include location of the mission, type of mission, length of mission, and the life of other equipment in use. This data field indicates whether the mask has hydration capability, and if so, the type and location of the hydration system.

4.3 Sizes Available

This data field indicates the variety of sizes available to the first responder community. There should be enough sizes to adequately fit most of the members of the response team, both male and female (XS).

4.4 Comfort/Weight

Comfort of the APR ensemble is based on the weight, fit, and feel of the facepiece. Weight indicates the weight of each component associated with the respirator, as well as the total weight of the working equipment/system (as worn).

4.5 Don/Doff Information

The don/doff information is the average time for donning and/or doffing, and also includes whether assistance is required for donning and/or doffing.

5.0 Logistics

5.1 Training

This data field indicates the type of training available from the manufacturer, including any initial training and recertification training. Training considers initial outfit testing and the man hours required to get certification to use the equipment. The availability of sustained training for the unit, annual or periodic, is also part of training criterion.

Indicate if your organization stresses to potential customers the importance of developing a written respiratory protection program that must be implemented in meeting all the requirements of OSHA 29 CFR 1910.134, including training, medical evaluation, and fit testing.

5.2 User Instruction Manual

A user instructions manual must be used in conjunction with the matrix-style label for the cartridge to define the approved configuration. User instructions include an APR canister approval label with CBRN Cap 1 protection or it is included in the packaging.

5.3 Maintenance Requirements

Maintenance requirements include the services and parts required to keep the system at its peak operational readiness (e.g., preventative maintenance). Following each use, respirators should be cleaned, disinfected, and stored according to the manufacturer's instructions. Indicate whether maintenance instruction is provided by hard copy or electronically.

5.4 Maintenance Cost

Maintenance cost is the cost required to maintain the system at its operational readiness. This cost will be based on equipment usage rates (i.e., cartridges, filters, etc.).

5.5 Use/Reuse

Use/reuse indicates the need for any part of the equipment to be discarded after use or its ability to be reused. Provide the availability of procedures to decontaminate and/or dispose of the equipment if it were used in a contaminated environment.

5.6 Shelf Life

Shelf life for APR stock items would be similar to the shelf life of a Level A ensemble. Shelf life should be in terms of years, or fractional years.

5.7 Shelf Life Packaged Canisters

Shelf life for packaged canisters is usually dictated by its chemical specificity and can be considered replacement time (the length of time it can be stored before losing its effectiveness and needs to be replaced).

5.8 Storage Conditions

Storage conditions include the recommended storage environment for the APR, as well as any factors that decrease shelf life (e.g., UV, critical temperature).

5.9 Packaging, Volume, and Shape

The package size and volume data field provides the external dimensions of the respirator and components when packaged (for storage and transportability). Package shape is also important when considering storing and transporting the respiratory equipment. Requirements may differ if the product package will be stored in a warehouse or on a vehicle.

5.10 Health Hazards and Safety

Health hazards include materials that possess a potential health hazard. An example of potential health hazard is the use of latex, an allergen.

5.11 Material Safety Data Sheet

A material safety data sheet (MSDS) is required if any of the materials used to manufacture the equipment possess a potential health hazard.

5.12 Warranty

Warranty is the length of time the APR is guaranteed by the manufacturer, including the terms of the warranty (parts and labor). This data field also includes specific details on what is covered in the warranty, along with the effective lifetime of the warranty, any restrictions in place by the manufacturer, the specific parts and labor that are covered, and the expected useful lifetime of the equipment.

APPENDIX K—APR INDEX AND DATA SHEETS

APPENDIX K—APR INDEX AND DATA SHEETS

ID#	Name	Manufacturer	Page K-#
1	Avon CBRN M53	Avon Protection Systems	K-1
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GENERAL

Avon CBRN M53

Model: CBRN M-53

Avon Protection Systems
503 Eighth Street
Cadillac, Michigan 49601
John Bevans, Project Manager
231-779-6200 (Tel)
231-779-6202 (Fax)
john.bevans@avon-rubber.com

Information Source: <http://www.avon-rubber.com>

Availability: In stock, minimum order required



NIOSH Status: In production for DOD

NIOSH CBRN Number: None

Certification Date: Not applicable

Unit Cost: \$1.2K

Component Cost: Call for pricing

Other Certifications: Not specified

Independent Testing: Independent testing carried out by a variety of organizations including ICS labs, Cleveland, Ohio (Laboratory Protection Factor testing, lens transmission, abrasion, cold temperature fogging tests, breathing resistance tests, etc). All of the above tests have been carried out within the 12 mo to May 2005.

Configuration: CBRN M-53 (4 sizes available)—Avon—to be determined

CBRN filter—Avon—to be determined

Prescription lens inserts (pair)—Avon—to be determined

Outserts (Clear/shaded/other)—Avon—to be determined

Microphone system—Avon—to be determined

Voice Projection Unit—Avon—to be determined

APR Description: M-53 incorporates many of the features of the M-50 full military specification NBC mask. It also includes a variable resistance exhalation unit that allows it to function on its own, with a SCPA or P APR. It is constructed from agent-resistant chlorobutyl/silicone blended rubber. The facepiece is available in 4 sizes. The front module includes the primary speech module for excellent speech transmission, the exhalation valve, and the drinks train with a dual valve and drinks tube allowing drinking from standard canteens and Camelbak type systems. The low-profile 6-point harness provides excellent comfort and compatibility with many inservice helmet systems. The polyurethane visor provides exceptional optical performance and is inherently scratch resistant. This enhanced field of view also ensures minimal eye relief and with the low-profile cheek and single filter provides optimum weapons sighting. The CBRN filter provides broad-spectrum capability in accordance with the NIOSH CBRN standard.

APR Application: Avon meets military specifications but needs further clarification of what standards are assumed in possible environments. The manufacturer does not provide specific guidance and warnings to users related to the use of the respiratory equipment in atmospheres with <19.5 % oxygen concentration as detailed in instructions.

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: The APR will protect against vapor, liquid, and aerosol forms of CAs, against particulate, aerosol, and liquid forms of BAs, and against radiological particulates

Breathing Performance:

- **Inhalation Resistance:** Less than 50 mm water
- **Exhalation Resistance:** Less than 15 mm water

Field of View: 85 %

Environmental Conditions: Not specified

Environmental Testing: Not specified

Faceblank Material: Avon proprietary—chlorobutyl/silicone blended rubber

Canister Capabilities:

- **Canister Capacity Rating:** Not specified
- **Canister Service Life:** Not specified

Chemical Specific Canisters: Not specified

Protection factor: Manufacturer has performed LRPL testing on the mask at the U.S. Army's Protection Factor Test Facility

DESIGN/CONFIGURATION

Visor: Single lens; visor is flexible polyurethane. Spectacle kit is available.

Visual Acuity: Not specified

Canister Design:

- **Canister Information:** One cartridge. P100 filter and 40 mm (1.57 in) DIN threads. Canister is cylinder shaped.
- **Canister Location:** Direct connection to mask; right mounted or left mounted (factory set)
- **Canister Mechanical Connection:** Does not have a standard Rd 40 x 1/7 thread

Gasket Mechanical Connection: Not specified

Facepiece Compatibility: Facepiece is not NIOSH certified for use with a PAPR or SCBA, but facepiece can be used with PAPR and SCBA

Interoperability with Equipment: Head lamps; active communication equipment

HUMAN FACTORS

Communication: Voice amplifier is not CBRN approved. VPU has not completed all testing at this time.

Hydration: Has manufacturer developed connector

Sizes Available: X-small, small, medium, and large

Comfort/Weight: 689 g (1.52 lb)

Training: Not specified

Manuals: Not specified

Color: Not specified

Don/Doff Information: 0 s to 30 s

LOGISTICS

Maintenance Required: Before and after each use

Use/Reuse: Equipment can be cleaned and reused with minimal effort

Package Shape/Volume: Not specified

Shelf Life:

- **Shelf Life (Facepiece):** Not specified
- **Shelf Life (Canister):** Not specified

Storage Conditions: Not specified

Sizes Available: X-small, small, medium, and large

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: Not specified

GENERAL

Avon CBRN C50

Model: CBRN C-50

Avon Protection Systems
503 Eighth Street
Cadillac, Michigan 49601
John Bevans, Project Manager
231-779-6200 (Tel)
231-779-6202 (Fax)
john.bevans@avon-rubber.com

Information Source: <http://www.avon-rubber.com>

Availability: In stock, minimum order required



NIOSH Status: Not specified

NIOSH CBRN Number: None

Certification Date: Not applicable

Unit Cost: \$300

Component Cost: Call for pricing

Other Certifications: CE approved

Independent Testing: Independent testing carried out by a variety of organizations including ICS labs, Cleveland Ohio (Laboratory Protection Factor testing, lens transmission, abrasion, cold temperature fogging tests, breathing resistance tests, etc). All the above tests have been carried out within the 12 mo to May 2005.

Configuration: CBRN C-50 (3 sizes available)—Avon—to be determined

CBRN C-50 filter—Avon—to be determined

Prescription lens inserts (pair)—Avon—to be determined

Outserts (Clear/shaded/Other)—Avon—to be determined

Microphone system—Avon—to be determined

Voice Projection Unit—Avon—to be determined

APR Description: C-50 is a modified version of the M-50 full military specification NBC mask, constructed from agent-resistant chlorobutyl/silicone blended rubber. The facepiece is available in 3 sizes. The front module includes the primary speech module for excellent speech transmission, the exhalation valve, and the drinks train with a dual valve and drinks tube allowing drinking from standard canteens and Camelbak type systems. The low-profile 6-point harness provides excellent comfort and compatibility with many inservice helmet systems. The polyurethane visor provides exceptional optical performance and is inherently scratch resistant. This enhanced field of view also ensures minimal eye relief, improving weapons sighting. The CBRN C-50 filter provides broad-spectrum capability in accordance with the NIOSH CBRN standard.

APR Application: Avon meets military specifications in the categories noted (radiation and biological) but needs further clarification of what standards are assumed. The APR is most likely to be used by first responders to CBRN incidents, especially law enforcement and other federal officers; and also will be used for tactical response. The manufacturer does not provide specific guidance and warnings to users related to the use of the respiratory equipment in atmospheres with <19.5 % oxygen concentration as detailed in instructions.

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: The APR will protect against vapor, liquid, and aerosol forms of CAs, against particulate, aerosol, and liquid forms of BAs, and against radiological particulates

Breathing Performance:

- **Inhalation Resistance:** Less than 50 mm water
- **Exhalation Resistance:** Less than 15 mm water

Field of View: 85 %

Environmental Conditions: Not specified

Environmental Testing: Not specified

Faceblank Material: Avon proprietary—chlorobutyl/silicone blended rubber

Canister Capabilities:

- **Canister Capacity Rating:** Not specified
- **Canister Service Life:** Not specified

Chemical Specific Canisters: Not specified

Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Single lens; visor is flexible polyurethane. Spectacle kit is available.

Visual Acuity: Not specified

Canister Design:

- **Canister Information:** One cartridge. P100 filter and 40 mm (1.57 in) DIN threads. Canister is cylinder shaped.
- **Canister Location:** Direct connection to mask; right mounted or left mounted
- **Canister Mechanical Connection:** Has a standard Rd 40 x 1/7 thread

Gasket Mechanical Connection: Not specified

Facepiece Compatibility: Facepiece is not NIOSH certified for use but can be used with a PAPR or SCBA

Interoperability with Equipment: Head lamps; active communication equipment

HUMAN FACTORS

Communication: Voice amplifier is not CBRN approved

Hydration: Has manufacturer developed connector

Sizes Available: Small, medium, and large

Comfort/Weight: 800 g (1.76 lb)

Training: Not specified

Manuals: Not specified

Color: Not specified

Don/DoFF Information: 0 s to 30 s

LOGISTICS

Maintenance Required: Before and after each use

Use/Reuse: Equipment can be cleaned and reused with minimal effort

Package Shape/Volume: Not specified

Shelf Life:

- **Shelf Life (Facepiece):** Not specified
- **Shelf Life (Canister):** Not specified

Storage Conditions: Not specified

Sizes Available: Small, medium, and large

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: Not specified

GENERAL

MSA Millennium® CBRN Gas Mask

Model: MSA-1

Mine Safety Appliances Company
 PO Box 428
 Pittsburgh, Pennsylvania 15230-0428
 Evan K. Erickson
 724-733-9274 (Tel)
 724-733-8573 (Fax)
 evan.erickson@msanet.com

Information Source: Responder Knowledge Database
<http://www.msanet.com>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnaapproved/apr/default.html#list>

Availability: In stock



NIOSH Status: CBRN Cap 1—Capacity meets a minimum 15 min test requirement

NIOSH CBRN Number: TC-14G-0270CBRN

Certification Date: 3/12/2004

Unit Cost: *2005 GSA prices. \$230—Millennium Facepiece (small, medium, large).

Component Cost: *2005 GSA prices
 \$29—CBRN canister; \$42—Spectacle kit
 \$41—Butyl hood; \$190—ESP II communications system
 \$14 to \$21—Outsert assemblies (clear \$14, tinted \$21)

Other Certifications: Millennium and Ultra Elite CBRN APR with 10046570 canister. CBRN certification of MSA Millennium and Ultra Elite Full Facepiece APR to 42 CFR 84.

Independent Testing: Not specified

Configuration: Millennium Facepiece—10051286 (small), 10051287 (medium), 10051288 (large)

CBRN canister—10046570

Spectacle kit—816137

Butyl hood—305022

ESP II communications system—10026265

Outsert assemblies—10008906 and 10008909

Configuration tested:

Millennium facepiece, medium, part no. 10006231

Millennium facepiece, small, part no. 10006232

Millennium facepiece, large, part no. 10006233

APR/CBRN 15 (Cap 1) canister, part no. 10046570

CBRN facepiece part numbers included in this approval are: 10006231, 10006232, 10006233, 7-934-1C, 7-934-3C, 7-934-2C

APR Description: Millennium CBRN APR with 10046570 canister. The MSA Millennium® CBRN gas mask combines high performance, customized fit, comfort and cost efficiency in a version that is similar to the MSA military-style gas mask (MCU-2/P). The Millennium® has a flexible, one-piece polyurethane lens with a wide field of vision that is bonded to the durable Hycar rubber facepiece. A fully elastic, 6-point head harness allows easy on/off and adjustment, with no hair pulling. The CBRN canister contains chemical sorbents and a P100 filter to attract, retain, and neutralize contaminants and can be attached to either side of the facepiece. A drinking tube provides connection for fluid ingestion. An internal nose cup with two check valves deflects air from the lens and reduces fogging. A standard mechanical speaking diaphragm is included, or an optional ESP® II communications system can be added. Other accessories include an ESPII communications system, butyl-coated nylon hood, gas mask pouch, police style, spectacle kit, and lens outserts. The Millennium CBRN gas mask is designed to be used as a system, and while the thread and gasket meet the specifications of the standard, only MSA manufactured components are tested and certified as assemblies. The facepiece is 42 CFR Part 84 NIOSH certified for use with a PAPR.

APR Application: Biological; not for use if oxygen <19.5 % as stated in the user manual

References: 20 000 units in use for up to 8 yr. Users wish to remain anonymous.

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: The APR will protect against vapor, liquid, and aerosol forms of CAs, against particulate, aerosol, and liquid forms of BAs, against gaseous, vapor, aerosol, and liquid forms of TICs/TIMs, and against radiological particulates

Breathing Performance:

- **Inhalation Resistance:** Meets NIOSH requirements. Canister airflow meets the military specifications of ≤ 55 mm water column when tested at 85 L/min continuous air flow.
- **Exhalation Resistance:** ≤ 20 mm (0.79 in)

Field of View: Meets NIOSH; 90 %

Environmental Conditions: Manufacturer has specific guidance or recommendations related to the use of the respiratory equipment in high heat and humidity environments

Environmental Testing: Passed hot diurnal, cold constant, humidity, vibration, and drop tests

Faceblank Material: Natural/Nitrile blend

Canister Capabilities:

- **Canister Capacity Rating:** CAP 1
- **Canister Service Life:** 15 d to 29 d—to determine the service life of the canister, you can use MSA's Cartridge Calculator. This web application can be found at <http://www.msanet.com/calculator>

Chemical Specific Canisters: All canisters meet NIOSH requirements

Protection factor: Manufacturer has performed LRPL testing on the mask at the U.S. Army's Protection Factor Test Facility—95 % of test subjects exceeded 2000; 95 % of test subjects exceeded an LRPL of 5000

DESIGN/CONFIGURATION

Visor: Single lens; visor is flexible. Visor contains coatings to enhance scratch resistance, reduce fogging, or perform other functions. Spectacle kit is available (part number 80100).

Visual Acuity: Eye test meets this performance criterion

Canister Design:

- **Canister Information:** Two cartridges. P100 filter and 40 mm (1.57 in) DIN threads. Cylindrical canister. Canister dimensions: 11 cm (4.33 in). Canister weight: 470 g (16.58 oz).
- **Canister Location:** Direct connection to mask; right/left interchangeable
- **Canister Mechanical Connection:** Has a standard Rd 40 x 1/7 thread

Gasket Mechanical Connection: Gasket is composed of ethylene propylene-diene-monomer (EDPM). Gasket material has been subjected to Gasket Test Methods required in the NIOSH CBRN APR Standard.

Facepiece Compatibility: Facepiece is NIOSH certified for use with an APR

Interoperability with Equipment: Active communication equipment

HUMAN FACTORS

Communication: CBRN approved voice amplifier. Speech intelligibility testing has been performed using NIOSH's test method.

Hydration: Compatible with standard M1 canteen cap

Sizes Available: Small, medium, and large

Comfort/Weight: Total weight as worn: 1051 g (2.32 lb)

Training: <8 h provided by manufacturer. Video training is available. Organization stresses to potential customers the importance of developing a written respiratory protection program that must be implemented in meeting all the requirements of OSHA 29 CFR 1910.134, including training, medical evaluation, and fit testing.

Manuals: Manual is available

Color: Not color-coded

Don/Doff Information: 0 s to 30 s

LOGISTICS

Maintenance Required: After each use. Maintenance costs are limited to the cost of canisters.

Use/Reuse: Equipment can be cleaned and reused with minimal effort. Procedures not available to decontaminate and/or dispose of used equipment.

Package Shape/Volume: Less than or equal to 0.028 m³ (1.0 ft³). Rigid cardboard, metal, or plastic.

Shelf Life:

- **Shelf Life (Facepiece):** ≥ 5 yr
- **Shelf Life (Canister):** ≥ 3 yr

Storage Conditions: Warehouse storage

Sizes Available: Small, medium, and large

Health Hazards and Safety: No health hazards

MSDS: MSDS is available

Warranty: Commercial

GENERAL

Scott CBRN/M120 Air Purifying Respirator

Model: CBRN/M120

Scott Health and Safety
4320 Goldmine Road
Monroe, North Carolina 28110
Greg Gatlin
704-291-8407 (Tel)
704-291-8420 (Fax)
ggatlin@tycoint.com

Information Source: Responder Knowledge Database
<http://www.scotthealthsafety.com>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnaapproved/apr/default.html#list>

Availability: Shipped ready to deploy



NIOSH Status: CBRN Cap 1—Capacity meets a minimum 15 min test requirement

NIOSH CBRN Number: TC-14G-0283CBRN

Certification Date: 3/24/06

Unit Cost: Not specified

Component Cost: Not specified

Other Certifications: Not specified

Independent Testing: Not specified

Configuration: Scott CBRN/M120 Air Purifying Respirator certified to NIOSH CBRN-APR Standard for CBRN Full Facepiece Air Purifying Respirators

APR Description: The Scott M120 CBRN facepiece offers a new generation in gas mask protection. It is engineered for maximum comfort and excellent permeation resistance to a wide variety of toxic materials and CBRN agents, but when combined with Scott's 40 mm cartridges, it is usable everyday. The M120 CBRN facepiece offers rapid deployment, simple disinfection and decontamination, and easy maintenance. With a sleek, low-profile design and a wide full-face lens for increased field of vision, users have the ultimate in NIOSH CBRN-approved protection available for the first responder law enforcement and emergency response community. Product highlights include the following: CBRN-approved with CBRN canister; 42 CFR-approved with appropriate cartridges; lightweight, comfortable, and ergonomically designed; easy disinfection, decontamination, and maintenance; dual 40 mm ports allow for right or left cartridge mounting; and shipped ready to deploy.

APR Application: No other CBRN gas mask offers a wider range of applications, from CBRN protection to riot control Hazmat response

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: CBRN approved

Breathing Performance:

- **Inhalation Resistance:** Canister airflow meets the military specifications of ≤ 55 mm water column when tested at 85 L/min continuous airflow.
- **Exhalation Resistance:** Not specified

Field of View: FOV—87 %. Wide full-face lens provides unobstructed field of vision and enhanced peripheral vision.

Environmental Conditions: Not specified

Environmental Testing: Not specified

Faceblank Material: Lens material—hard coated polycarbonate resists scratching. Head harness—EPDM. Facepiece—halobutyl. Nosecup—soft, clear silicone nose cup minimizes lens fogging by directing the airflow over the lens while providing a comfortable fit.

Canister Capabilities:

- **Canister Capacity Rating:** CAP 1
- **Canister Service Life:** Not specified

Chemical Specific Canisters: NIOSH 42 CFR approved when used with Scott's Enforcement cartridge, MPC Plus cartridge, or P100 cartridge

M120 canister test challenge and test breakthrough concentrations (time for breakthrough for CBRN APR negative pressure is a minimum of 15 min)

Chemical—Test conc. (PPM)—Breakthrough conc. (PPM)

Ammonia—2500 ppm—12.5 ppm

Cyanogen chloride—300 ppm—2 ppm
Cyclohexane—2600 ppm—10 ppm
Formaldehyde—500 ppm—1 ppm
Hydrogen cyanide—940 ppm—4.7 ppm (sum if HNC and C2N2)
Hydrogen sulfide—1000 ppm—5 ppm
Nitrogen dioxide—200 ppm—1 ppm NO₂ or 25 ppm NO. Nitrogen dioxide breakthrough is monitored for both NO₂ and NO. The breakthrough is determined by which quantity reaches breakthrough first.
Phosgene—250 ppm—1.25 ppm
Phosphine—300 ppm—0.3 ppm
Sulfur dioxide—1500 ppm—5 ppm
Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Single lens—hard coated polycarbonate

Visual Acuity: Not specified

Canister Design:

- **Canister Information:** Dual 40 mm canister ports allow for canister to be mounted left or right side for proper weapon sighting
- **Canister Location:** Direct connection to mask; right/left interchangeable
- **Canister Mechanical Connection:** Dual 40 mm canister ports

Gasket Mechanical Connection: Not specified

Facepiece Compatibility: Not specified

Interoperability with Equipment: Has spectacle kit (large openings), alternate spectacle kit, tactical facepiece bag with belt mounting, shoulder strap for tactical facepiece bag, leg strap for tactical facepiece bag, and fleece facepiece bag. Kit includes one M120 facepiece and one CBRN canister.

HUMAN FACTORS

Communication: Built-in, high-efficiency speech diaphragm provides superior personal communications

Hydration: Not specified

Sizes Available: Small and medium/large

Comfort/Weight: Mask with canister: 860 g (1.9 lb)

Mask only: 460 g (1.01 lb)

Canister weight: 480 g (0.9 lb); weight in packaging 550 g (1.2 lb)

Training: Not specified

Manuals: Not specified

Color:

Don/DoFF Information: Five-point, easily adjustable head harness for quick and easy donning

LOGISTICS

Maintenance Required: Not specified

Use/Reuse: EPDM molded head harness for easy cleaning and decontamination

Package Shape/Volume: Canister height: 10.4 cm (4.11 in); canister diameter: 11.0 cm (4.33 in)

Shelf Life:

- **Shelf Life (Facepiece):** Not specified
- **Shelf Life (Canister):** Canister shelf life is 7 yr stored in original packaging

Storage Conditions: Canister packaging material is polypropylene with a magnetic induction seal. Canister housing material is polyamide

Sizes Available: Small and medium/large

Health Hazards and Safety: Hypoallergenic, halobutyl material provides maximum user comfort and excellent resistance against CBRN agents and toxic materials

MSDS: Not specified

Warranty: Scott warrants the M120 CBRN facepiece to be free from defects in workmanship and material for a period of 1 yr from the date of shipment by Scott

GENERAL

Survivair Opti-Fit™ CBRN Gas Mask

Model: Opti-Fit 001

Survivair Respirators, Inc.
3001 South Susan Street
Santa Ana, California 92704
Angela Benoit, Government Sales Manager
Robert Wong, APR Product Manager
724-745-3305 (Tel)
714-427-5204 (Tel)
adbenoit@bacou-dalloz.com
rwong@bacou-dalloz.com

Information Source: Responder Knowledge Database
<http://www.bacou-dalloz.com>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnaapproved/apr/default.html#list>

Availability: In stock; minimum order not required



NIOSH Status: CBRN Cap 1—Capacity meets a minimum 15 min test requirement

NIOSH CBRN Number: TC-14G-0272CBRN

Certification Date: 1/31/2005

Unit Cost: \$224—OptiFit CBRN Mask
\$45—CBRN canister

Component Cost: Not specified

Other Certifications: NIOSH 42 CFR 84 Survivair Opti-Fit full facepiece with 1688 canister, 14G-0264, November 8, 2001; ANZI Z87.1

Independent Testing: AIE Testing and Research, Inc. Canister Shelf Life for CN/CS tested May 17, 2005.

Configuration: NIOSH approved with the Model 1690 CBRN Canister (NIOSH Cap 1)

APR Description: Survivair® Opti-Fit™ Cap 1 CBRN Gas Mask, with the Model 1690 CBRN Canister, is the latest product in the Opti-Fit family. It is an affordable full-facepiece respirator that meets all the requirements of the NIOSH CBRN APR standard, CAP 1 rating. It also complies with the ANSI Z87.1 standard. The CBRN gas mask was developed specifically for first responders and provides respiratory protection from CBRN agents in addition to TIMs. It has an optically correct, single-piece polycarbonate lens that provides a wide field of vision. The Opti-Fit CBRN gas mask features a durable, chemical-resistant butyl rubber face skirt; three-position canister mounting; optional hydration drink tube; standard nose-cup; and a 5-strap, silicone head harness.

APR Application: Radiation and biological; not for use in IDLH atmospheres

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: CBRN approved

Breathing Performance:

- **Inhalation Resistance:** Measured value of airflow resistance is 50.5 mm. One filter can be used without inhibiting the flow rate.
- **Exhalation Resistance:** ≤ 20 mm (0.79 in)

Field of View: FOV—88 %, VFS—105; overlapping FOV—96 %

Environmental Conditions: Maximum storage temp is 60 °C (140 ° F); passed hot diurnal, cold constant, humidity, vibration, and drop tests with no adverse effects. Not subjected to additional environmental testing.

Environmental Testing: Passed hot diurnal, cold constant, humidity, vibration, and drop tests

Faceblank Material: Chlorobutyl rubber skirt attached to polycarbonate lens with solid nylon frame

Canister Capabilities:

- **Canister Capacity Rating:** CAP 1
- **Canister Service Life:** Must be used immediately; no tools provided for estimating canister service life

Chemical Specific Canisters: Ammonia*—169001 Canister ID—2500 ppm—25/25 °C/% and 25/80 °C/%—12.5 ppm—64 L/min—15 min

Chloroacetophenone—169001 Canister ID—16 ppm—25/25 °C/% and 25/80 °C/%—0.5 ppm—64 L/min—480 min

Chlorobenzene malononitrile—169001 Canister ID—3 ppm—25/25 °C/% and 25/85 °C/%—0.5 ppm—64 L/min—480 min

Cyanogen chloride*—169001 Canister ID—300 ppm—25/25 °C/% and 25/80 °C/%—2 ppm—64 L/min—15 min

Cyclohexane*—169001 Canister ID—2600 ppm—25/25 °C/% and 25/80 °C/%—10 ppm—64 L/min—15 min
Formaldehyde*—169001 Canister ID—500 ppm—25/25 °C/% and 25/80 °C/%—1 ppm—64 L/min—15 min
Hydrogen cyanide*—169001 Canister ID—940 ppm—25/25 °C/% and 25/80 °C/%—4.7 ppm—64 L/min—15 min
Hydrogen sulfide*—169001 Canister ID—1000 ppm—25/25 °C/% and 25/80 °C/%—1 ppm—64 L/min—15 min
Nitrogen dioxide*—169001 Canister ID—200 ppm—25/25 °C/% and 25/80 °C/%—4.7 ppm—64 L/min—15 min
Phosgene*—169001 Canister ID—250 ppm—25/25 °C/% and 25/80 °C/%—1.25 ppm—64 L/min—15 min
Phosphine*—169001 Canister ID—300 ppm—25/25 °C/% and 25/80 °C/%—0.3 ppm—64 L/min—15 min
Sulfur dioxide*—169001 Canister ID—1500 ppm—25/25 °C/% and 25/80 °C/%—55 ppm—64 L/min—15 min
Protection factor: Manufacturer has performed LRPL testing on the mask with 73 tested passes. 95 % of test subjects exceeded 2000 with a range of 28.5 to 100 000 measured across all subjects.

DESIGN/CONFIGURATION

Visor: Single lens—polycarbonate

Rigid, polycarbonate visor meets impact and penetration requirements of ANSI Z87.1–1989 (R–1998); has hard coating for scratch resistance. Spectacle case is available for the mask.

Visual Acuity: Visual acuity greater than 20/35 obtained during low temperature fogging test

Canister Design:

- **Canister Information:** One cartridge. P100 filter and 40 mm (1.57 in) DIN threads. Three mounting positions. Cylindrical canister is capable of passing through a 5 in opening. Canister dimensions: 8.84 cm x 11.15 cm (3.48 in x 4.39 in). Canister weight: 352 g (12.42 oz).
- **Canister Location:** Direct connection to mask; 3-position canister mounting (right, left, or center). Interface between canister and respirator system is a standard Rd 40 x 1/7 thread.
- **Canister Mechanical Connection:** Has a standard Rd 40 x 1/7 thread

Gasket Mechanical Connection: Gasket is composed of ethylene propylene-diene-monomer (EDPM). Gasket material has been subjected to Gasket Test Methods required in the NIOSH CBRN APR Standard.

Facepiece Compatibility: Facepiece is NIOSH certified for use with an APR

Interoperability with Equipment: Has neckstrap, drink tube, clear lens cover, and spectacle kit

HUMAN FACTORS

Communication: No voice amplifier; overall speech intelligibility performance rating of 80.1

Hydration: Mask is equipped with hydration system and is compatible with standard M1 canteen cap

Sizes Available: Small, medium, and large

Comfort/Weight: Facepiece: 684 g (1.51 lb)

Canister: 350 g (0.77 lb)

Total: 1034 g (2.28 lb)

Training: <8 h not provided by the manufacturer; respiratory protection program is stated in the instructions. The organization stresses the importance of developing a written respiratory protection program as stated in the user instruction manual.

Manuals: User instruction manual

Color: Equipment or components are not color-coded

Don/DoFF Information: 0 s to 30 s

LOGISTICS

Maintenance Required: Before and after each use; also semi-annually

Use/Reuse: Equipment can be cleaned and reused with minimal effort; but canister must be replaced after each use.

Decontamination or disposal must be established by Incident Command.

Package Shape/Volume: Less than or equal to 0.028 m³ (1.0 ft³). Rigid (cardboard).

Shelf Life:

- **Shelf Life (Facepiece):** ≥ 15 yr
- **Shelf Life (Canister):** ≥ 5 yr, 10 yr from the date of manufacture. A minimum of 7 yr.

Storage Conditions: 25 °C (77 °F); 25 % rh. Extended storage time must not exceed the environmental factors.

Sizes Available: Small, medium, and large

Health Hazards and Safety: Contains latex but no other allergens

MSDS: MSDS is available

Warranty: Not specified

GENERAL

3M™ FR-7800B Full Facepiece

Model: FR-7800B

3M
 3M Center, Building 235-2W-70
 Saint Paul, Minnesota 55144-1000
 Geoff Betsinger
 800-243-4630 (Tel) Technical
 800-328-1667 (Tel) Sales
 651-736-7344 (Fax)
 gbbetsinger@mmm.com

Information Source: Responder Knowledge Database
<http://www.3m.com>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnaapproved/apr/default.html#list>



NIOSH Status: CBRN CAP 1—Capacity meets a minimum 15 min test requirement (42 CFR 84 with APR CBRN statement of standard)

NIOSH CBRN Number: TC-14G-0271CBRN

Certification Date: 5/10/2005

Unit Cost: \$272

Component Cost: \$175/case—4FR-15-CBRN

Other Certifications: NIOSH approved with 3M™ Canister CP3N for use against CS, CN and as a P100 filter (TC-14G-0251) in riot conditions, including those with teargas (non-CBRN). Lens meets ANSI Z87+ standard, providing high-impact protection. This facepiece can be used as primary eye protection

Independent Testing: Not specified

Configuration: Facepiece is NIOSH-approved with 3M™ Canister FR-15-CBRN (TC-14G-0271). Also NIOSH-approved with 3M™ Canister CP3N for use against CS, CN and as a P100 filter (TC-14G-0251) in riot conditions, including those with teargas (non-CBRN).

APR Description: The 3M™ Full Facepiece Respirator FR-7800B with 3M™ Canister FR-15-CBRN was designed specifically for first responders and features a low-profile design to improve comfort. The FR-7800B is designed to help provide respiratory protection against certain airborne contaminants when used in accordance with all use and limitation instructions and applicable safety and health regulations.

APR Application: Law enforcement agencies, security personnel, medical personnel, fire department response teams, hazmat teams, emergency medical technicians (EMTs), domestic preparedness personnel, and military personnel in CBRN environments. Not for use if oxygen <19.5 %.

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: FR-15-CBRN canister specifications can filter a wide range of CAs such as nerve agents tabun (GA), sarin (GB), soman (GD), and (VX); mustard/blister agents—H, HD, and L; tear agents—CN, CS, CR, and OC; blood agents—hydrogen cyanide (AC), cyanogen chloride (CK), and arsine (SA); and choking agents—chlorine, phosgene, chloropicrin (PS), and diphenylchloroarsine (DA). 3M™ full facepiece FR-7800B with canister FR-15-CBRN can also filter common industrial chemicals such as organic vapors, chlorine dioxide, chlorine, hydrogen fluoride, hydrogen sulfide, sulfur dioxide, ammonia, methylamine, formaldehyde, nitrogen dioxide, phosphine, and particles

Breathing Performance:

- **Inhalation Resistance:** Facepiece plus canister is <50 mm (1.97 in) H₂O at 85 L/min. One filter can be used without inhibiting the flow rate. The canister airflow meets the military specifications of ≤ 55 mm water column when tested at 85 L/min continuous air flow. FR-7800B with FR-15-CBRN Canister is <50 mm H₂O at 85 L/min.
- **Exhalation Resistance:** 14 mm to 15 mm (0.55 in to 0.59 in)

Field of View: Field of view—100 %

Environmental Conditions: Service life of the canister against organic vapors will be less in high rh environments

Environmental Testing: Passed hot diurnal, cold constant, humidity, vibration, and drop tests

Faceblank Material: Butyl rubber

Canister Capabilities:

- **Canister Capacity Rating:** CAP 1
- **Canister Service Life:** Once canister is opened, service life must be determined according to contaminant concentration, temperature, etc. 3M™ Service Life Software is available free at www.3m.com/occsafety, Technical data bulletin No. 162.

Chemical Specific Canisters: Challenge Chemical—Canister ID—Challenge Concentration—T/RH—Breakthrough Concentration—Flow Rate—Normalized Gas Life

Ammonia*—FR-15-CBRN—2500 ppm—25 °C/25 % RH and 80 % RH—12.5 ppm—64 L/min—>15 min

Chlorine dioxide—FR-15-CBRN—500 ppm—25 °C/50 % RH—0.1 ppm—64 L/min—>30 min

Carbon Tetrachloride—FR-15-CBRN—1000 ppm—25 °C/50% RH—5 ppm—64 L/min—>25 min

Chlorine—FR-15-CBRN—500 ppm—25 °C/50 % RH—5 ppm—64 L/min—>17.5 min

Chloroacetophenone—FR-15-CBRN—16 ppm—25 °C/50 % RH—0.05 ppm—64 L/min—>480 min

Chlorobenzylidenemalononitrile—FR-15-CBRN—3 ppm—25 °C/50 % RH—0.05 ppm—64 L/min—>480 min

Chloropicrin—FR-15-CBRN—744 ppm—25 °C/80 % RH—0.74 ppm—64 L/min—>27 min

Cyanogen chloride*—FR-15-CBRN—300 ppm—25 °C/80 % RH—2 ppm—64 L/min—>15 min

Cyclohexane*—FR-15-CBRN—2600 ppm—25 °C/80 % RH—10 ppm—64 L/min—>15 min

DMMP—FR-15-CBRN—591 ppm—26 °C/dry—0.008 ppm—50 L/min—>59 min

Formaldehyde*—FR-15-CBRN—500 ppm—25 °C/80 % RH—1 ppm—64 L/min—>15 min

Hydrogen chloride—FR-15-CBRN—500 ppm—25 °C/50 % RH—5 ppm—64 L/min—>25 min

Hydrogen cyanide*—FR-15-CBRN—3618 ppm—25 °C/25 % RH and 80 % RH—4.5 ppm—64 L/min—>28 min

Hydrogen fluoride—FR-15-CBRN—70 ppm—25 °C/50 % RH—3 ppm—64 L/min—>30 min

Hydrogen sulfide*—FR-15-CBRN—1000 ppm—25 °C/50 % RH—10 ppm—64 L/min—>30 min

Methylamine—FR-15-CBRN—1000 ppm—25 °C/50 % RH—10 ppm—64 L/min—>12.5 min

Nitrogen dioxide*—FR-15-CBRN—200 ppm—25 °C/25 % RH and 80 % RH—1 ppm—64 L/min—>15 min

Phosgene*—FR-15-CBRN—4943 ppm—25 °C/50 % RH—2 ppm—64 L/min—>25 min

Phosphine*—FR-15-CBRN—1500 ppm—25 °C/50 % RH—0.3 ppm—64 L/min—>12 min

Sulfur dioxide*—FR-15-CBRN—1500 ppm—25 °C/25 % RH and 80% RH—5 ppm—64 L/min—>15 min

Protection factor: Passed CBRN testing. Results from RDECOM available upon NIOSH approval. Los Alamos Grid—smallest grid. Subject on border of grid; all other grids included.

DESIGN/CONFIGURATION

Visor: Single lens; visor is rigid polycarbonate. Spectacle kit is available. The respirator passes the NIOSH CBRN fogging test and is tested to the following sections of the CBRN APR standard for lens Material Haze (3.7.1), Luminous Transmittance (3.7.2), and Abrasion Resistance (3.7.3).

Visual Acuity: The lens is designed with proper correction factor and meets the ANSI Z87.1–2003 standard

Canister Design:

- **Canister Information:** One cartridge. P100 filter and 40 mm (1.57 in) DIN threads. Canister dimensions: cylinder 11 cm (4.33 in) diameter x 7.6 cm (2.99 in) high. Canister weight: 335 g (11.82 oz).
- **Canister Location:** Direct connection to mask; right/left interchangeable
- **Canister Mechanical Connection:** Has a standard Rd 40 x 1/7 thread

Gasket Mechanical Connection: Gasket is composed of ethylene propylene-diene-monomer (EDPM). Gasket material has been subjected to Gasket Test Methods required in the NIOSH CBRN APR Standard.

Facepiece Compatibility: Facepiece is NIOSH certified for use with an APR

Interoperability with Equipment: Not specified

HUMAN FACTORS

Communication: No voice amplifier. Speech intelligibility testing has been performed using NIOSH's test method (overall performance rating >70 %).

Hydration: Not equipped

Sizes Available: Small, medium, and large

Comfort/Weight: Total weight as worn: 935 g (2.06 lb) includes canister

Training: Training time depends on person; 3M™ Respirator e-Training takes 25 min to 65 min. Written respiratory protection program materials available on request.

Manuals: Manual is available

Color: Not color-coded

Don/Doff Information: Not specified

Maintenance Required: Before and after each use

Use/Reuse: Equipment can be cleaned and reused with minimal effort. Procedures are available to decontaminate and/or dispose of used equipment.

Package Shape/Volume: Less than or equal to 0.028 m³ (1.0 ft³). Rigid (cardboard).

Shelf Life:

- **Shelf Life (Facepiece):** Not specified
- **Shelf Life (Canister):** >/=5 yr

Storage Conditions: Recommend storage in cool clean environment

Sizes Available: Small, medium, and large

Health Hazards and Safety: Speaking diaphragm gasket contains latex

MSDS: MSDS is available

Warranty: 3M will replace or refund the purchase price of any OH&ESD product found to be defective in material, manufacture, or not in conformance with any express warranty. This warranty is exclusive and in lieu of any implied warranty of merchantability or fitness for a particular purpose. **Limitation of liability:** Except as provided above, 3M shall not be liable or responsible for any loss or damage, whether direct, indirect, incidental, special or consequential arising out of the sale, use or misuse of 3M OH&ESD products, or the user's inability to use such products. These remedies set forth herein are exclusive.

GENERAL

Dräger CDR 4500**Model:** Full Facepiece (R55440); Canister (6738146)

Dräger Safety
 101 Technology Drive
 Pittsburgh, Pennsylvania 15275
 George Blank
 412-787-8383 (Tel)
 412-787-2207 (Fax)
 George.Blank@Draeger.com

Information Source: <http://www.draeger-safety.com>**NIOSH Status:** Not specified**NIOSH CBRN Number:** None**Certification Date:** Not applicable**Unit Cost:** \$220**Component Cost:** Not specified**Other Certifications:** EN 136**Independent Testing:** Not specified**Configuration:** Spectacle kit (Dräger)—R51548; spectacle kit (Dräger)—4056406

APR Description: The general description of the CDR 4500 mask is almost identical to the Panorama Nova except the CDR 4500 is only available in black. The mask body is available in EPDM (ethylene propylene dimonomer) or soft contouring silicone, and can be gotten with a stainless steel lens retainer or with a black plastic retainer to reduce reflective surfaces. The mask has a centrally located cartridge connection, an installed nose cup, and a stainless steel speech diaphragm. The 5-point headstrap is infinitely adjustable. The Panorama Nova can be used with respiratory filters, compressed air- or closed circuit breathing apparatus, or a power assisted filtering device. The Panorama masks accept the full range of Dräger filters, cartridges, and canisters. Its triple edge sealing design provides fit and comfort in one size, i.e., three face sizes (small, medium, and large) fit with one Panorama mask. Accessories include a hairnet, a communication device, spectacle kits, and antifogging agents. The facepiece is NIOSH certified for use with a PAPR and has passed NFPA 1981 Standard for Open-Circuit SCBA for Fire and Emergency Services. In addition a spectacle kit is offered for an additional charge.

APR Application: Not for use if oxygen <19.5 % as stated in the user manual

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: The APR will protect against vapor, liquid, and aerosol forms of CAs, against particulate, aerosol, and liquid forms of BAs, against gaseous, vapor, aerosol, and liquid forms of TICs/TIMs, and against radiological particulates

Breathing Performance:

- **Inhalation Resistance:** Average is 57 mm water column. Canister airflow does not meet the military specifications of ≤ 55 mm water column when tested at 85 L/min continuous air flow.
- **Exhalation Resistance:** Less than 20 mm water

Field of View: FOV—81.2 %; overlapping field of view to the unmasked—92.8 %**Environmental Conditions:** Operating temperature range: -30 °C to 120 °C (-22 °F to +248 °F). Apply anti-fog solution for low-temperature operation and leave the area if the lens is damaged or deformed at high-temperature operations.**Environmental Testing:** Passed hot diurnal, cold constant, humidity, vibration, and drop tests**Faceblank Material:** EPDM**Canister Capabilities:**

- **Canister Capacity Rating:** CAP 1 (not CBRN)
- **Canister Service Life:** Manufacturer does not provide tools for estimating canister service life and the effects of temperature/relative humidity on canister performance

Chemical Specific Canisters: Ammonia—4 canister ID—1750 mg/m³—25/85 °C/%—8.75 mg/m³—64 L/min—19 min
 Cyanogen chloride—9 canister ID—756 mg/m³—25/85 °C/%—5.04 mg/m³—64 L/min—>56 min
 Cyclohexane—14 canister ID—8944 mg/m³—25/85 °C/%—34.4 mg/m³—64 L/min—56 min

Formaldehyde—22 canister ID—615 mg/m³—25/85 °C/%—1.23 mg/m³—64 L/min—>15 min
Hydrogen cyanide—27 canister ID—1034 mg/m³—25/85 °C/%—5.17 mg/m³—64 L/min—53 min
Hydrogen sulfide—33 canister ID—1400 mg/m³—25/85 °C/%—7 mg/m³—64 L/min—>15 min
Nitrogen dioxide—39 canister ID—376 mg/m³—25/85 °C/%—1.88 mg/m³—64 L/min—46 min
Phosgene—46 canister ID—1012.5 mg/m³—25/85 °C/%—5.06 mg/m³—64 L/min—>15 min
Phosphine—52 canister ID—417 mg/m³—25/85 °C/%—0.41 mg/m³—64 L/min—>15 min
Sulfur dioxide—58 canister ID—3930 mg/m³—25/85 °C/%—13.1 mg/m³—64 L/min—24 min

Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Single lens; visor is rigid polycarbonate. Visor contains coatings to enhance scratch resistance, reduce fogging, or perform other functions. Spectacle kit is available.

Visual Acuity: Eye test meets this performance criterion

Canister Design:

- **Canister Information:** One cartridge. P100 filter and 40 mm (1.57 in) DIN threads. Canister dimensions: cylinder 10.8 cm (4.25 in) diameter x 8.26 cm (3.25 in) high. Canister weight: 310 g (10.93 oz).
- **Canister Location:** Direct connection to mask; center mounted
- **Canister Mechanical Connection:** Has a standard Rd 40 x 1/7 thread

Gasket Mechanical Connection: Gasket is composed of ethylene propylene-diene-monomer (EDPM)

Facepiece Compatibility: Facepiece is not NIOSH certified for use but can be used with a PAPR or SCBA

Interoperability with Equipment: Active communication equipment

HUMAN FACTORS

Communication: Voice amplifier is not CBRN approved. Communications system has been approved for CBRN SCBA. Speech intelligibility testing has not been performed using NIOSH's test method. Other tests: Passed NFPA 1981 Standard for Open-Circuit SCBA for Fire and Emergency Services.

Hydration: No hydration capability

Sizes Available: One size fits all (fits small, medium, and large)

Comfort/Weight: CDR 4500 Facepiece: 544 g (1.2 lb)

CDR 4500 Facepiece with canister: 853 g (1.88 lb)

Spectacle Kit : 13.61 g (0.03 lb)

Training: Training time not specified. Organization stress to potential customers the importance of developing a written respiratory protection program that must be implemented in meeting all the requirements of OSHA 29 CFR 1910.134, including training, medical evaluation, and fit testing.

Manuals: Manual is available

Color: Canister is black; CDR 4500 facepiece is black; optional black lens frames

Don/Doff Information: 31 s to 60 s

LOGISTICS

Maintenance Required: Maintenance not required until after 4 yr. Visual inspection before and after use; leak check at 6 mo; replace components at 4 yr and 6 yr.

Use/Reuse: Procedures not available to decontaminate and/or dispose of used equipment

Package Shape/Volume: Soft-sided duffle bag (with or without straps) or rigid (metal or plastic)

Shelf Life:

- **Shelf Life (Facepiece):** >10 yr
- **Shelf Life (Canister):** >5 yr

Storage Conditions: -15 °C to 25 °C (5 °F to 77 °F). CDR 4500 facepieces are to be kept out of direct sunlight during storage.

Sizes Available: One size fits all (fits small, medium, and large)

Health Hazards and Safety: No latex

MSDS: Available upon request

Warranty: Not specified

GENERAL

MSA Ultra Elite CBRN Gas Mask**Model:** CBRN 200 (100527XX)

Mine Safety Appliances Company
 PO Box 428
 Pittsburgh, Pennsylvania 15230-0428
 Evan K. Erickson
 724-733-9274 (Tel)
 724-733-8573 (Fax)
 evan.erickson@msanet.com

Information Source: Responder Knowledge Database
<http://www.msanet.com>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnaapproved/apr/default.html#list>

Availability: In stock**NIOSH Status:** CBRN Cap 1—Capacity meets a minimum 15 min test requirement**NIOSH CBRN Number:** TC-14G-0270CBRN**Certification Date:** 3/12/2004

Unit Cost: *2005 GSA prices
 \$155 to \$181—10052776 through 10052781*
 \$236 each—supplier prices for small, medium, or large
 \$45—CBRN canister

Component Cost: *2005 GSA prices
 \$29—10046570
 \$42—454819, 804638, 493581
 \$159, \$185, \$92—10023056, 10023057, 10023055
 \$28—805456, 491500
 \$41—305022

Other Certifications: Millennium and Ultra Elite CBRN APR with 10046570 canister. CBRN certification of MSA Millennium and Ultra Elite Full Facepiece APR to 42 CFR 84.

Independent Testing: Not applicable

Configuration: Ultra Elite Facepiece, three sizes, two head harnesses—10052776 through 10052781
 CBRN canister—10046570

Spectacle kit—454819, 804638, and 493581

Communications system—10023056, 10023057, and 10023055

Lens covers—805456, 491500

Butyl hood—305022

Millennium facepiece, medium, part no. 10006231

Millennium facepiece, small, part no. 10006232

Millennium facepiece, large, part no. 10006233

APR/CBRN 15 (Cap 1) canister, part no. 10046570

CBRN facepiece part numbers included in this approval are: 10006231, 10006232, 10006233, 7-934-1C, 7-934-3C, 7-934-2C

APR Description: MSA Ultra Elite Full Facepiece with either a rubber head harness or Kevlar Speed-On head harness Cap 1, with 10046570 canister. CBRN certification of MSA Millennium and Ultra Elite Full Facepiece APR to 42 CFR 84.

APR Application: Biological; not for use if oxygen <19.5 % as stated in the user manual

References: 20 000 units in use for up to 8 yr. Users wish to remain anonymous.

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: The APR will protect against vapor, liquid, and aerosol forms of CAs, against particulate, aerosol, and liquid forms of BAs, against gaseous, vapor, aerosol, and liquid forms of TICs/TIMs, and against radiological particulates

Breathing Performance:

- **Inhalation Resistance:** Meets NIOSH requirements. Canister airflow meets the military specifications of ≤ 50 mm water column when tested at 85 L/min continuous air flow.
- **Exhalation Resistance:** ≤ 20 mm (0.79 in)

Field of View: Large lens with 83 % unimpeded vision

Environmental Conditions: Manufacturer has specific guidance or recommendations related to the use of the respiratory equipment in high heat and humidity environments

Environmental Testing: Passed hot diurnal, cold constant, humidity, vibration, and drop tests

Faceblank Material: Natural/nitrile blend

Canister Capabilities:

- **Canister Capacity Rating:** CAP 1
- **Canister Service Life:** 15 d to 29 d—to determine the service life of the canister, you can use MSA's Cartridge Calculator. This web application can be found at <http://www.msanet.com/calculator>.

Chemical Specific Canisters: All canisters meet NIOSH requirements

Protection factor: Manufacturer has performed LRPL testing on the mask at the U.S. Army's Protection Factor Test Facility—95 % of test subjects exceeded 2000; 95 % of test subjects exceeded an LRPL of 5000

DESIGN/CONFIGURATION

Visor: Single lens; visor is flexible polyurethane and contains coatings to enhance scratch resistance, reduce fogging, or perform other functions. Spectacle kit is available (part number 80100).

Visual Acuity: Eye test meets this performance criterion

Canister Design:

- **Canister Information:** Two cartridges. P100 filter and 40 mm (1.57 in) DIN threads.
- **Canister Location:** Direct connection to mask; centrally located inlet port
- **Canister Mechanical Connection:** Has a standard Rd 40 x 1/7 thread

Gasket Mechanical Connection: Gasket is composed of ethylene propylene-diene-monomer (EDPM). Gasket material has been subjected to Gasket Test Methods required in the NIOSH CBRN APR Standard.

Facepiece Compatibility: Facepiece is NIOSH certified for use with the OptimAir 6A PAPR

Interoperability with Equipment: Active communication equipment

HUMAN FACTORS

Communication: CBRN-approved voice amplifier. Speech intelligibility testing has been performed using NIOSH's test method.

Hydration: Compatible with standard M1 canteen cap

Sizes Available: Small, medium, and large

Comfort/Weight: Total weight as worn: 1196 g (2.64 lb)

Training: <8 h provided by manufacturer. Video training is available. Organization stresses to potential customers the importance of developing a written respiratory protection program that must be implemented in meeting all the requirements of OSHA 29 CFR 1910.134, including training, medical evaluation, and fit testing.

Manuals: Manual is available

Color: Not color-coded

Don/Doff Information: 0 s to 30 s

LOGISTICS

Maintenance Required: After each use. Maintenance costs are limited to the cost of canisters.

Use/Reuse: Equipment can be cleaned and reused with minimal effort. Procedures not available to decontaminate and/or dispose of used equipment.

Package Shape/Volume: Less than or equal to 0.028 m³ (1.0 ft³). Rigid cardboard, metal, or plastic.

Shelf Life:

- **Shelf Life (Facepiece):** >15 yr
- **Shelf Life (Canister):** 5 yr

Storage Conditions: Warehouse storage

Sizes Available: Small, medium, and large

Health Hazards and Safety: No health hazards

MSDS: MSDS is available

Warranty: Commercial

GENERAL

North 54500 Series CBRN APR**Model:** 54501 CBRN and 54501S CBRN

North Safety Products
 2000 Plainfield Pike
 Cranston, Rhode Island 02921
 Lynn Aurelius
 858-722-1200 (Tel)
 401-943-4400 (Tel)
 401-275-2618 (Fax)
 Lynn.Aurelius@NorthSafety.com

Information Source: Responder Knowledge Database
<http://www.northsafety.com>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnaapproved/apr/default.html#list>
Availability: In stock



NIOSH Status: CBRN Cap 1—Capacity meets a minimum 15 min test requirement

NIOSH CBRN Number: TC-14G-0273CBRN

Certification Date: 6/29/2005

Unit Cost: The CBRN respirator will be sold through Safety Distributors. Costs may vary.

Component Cost: Component will be sold through Safety Distributors. Costs may vary.

Other Certifications: The lens was tested and passed ANSI standards for impact and penetration resistance. This configuration consists of a full facepiece (p/n 54501 or 54501S), a canister (p/n 40CBRN), a User's Instruction Manual (p/n 80754), anti-fog wipes (part no. 80944), a carry bag (p/n 54 BAG) and two poly-bags for facepiece and anti-fog storage.

Independent Testing: Not specified

Configuration: This configuration consists of a full facepiece (p/n 54501 or 54501S), a canister (p/n 40CBRN), a User's Instruction Manual (p/n 80754), anti-fog wipes (p/n 80944), a carry bag (p/n 54 BAG), and two poly-bags for facepiece and anti-fog storage.

CBRN Mask (M/L)—North Safety Products—54501

CBRN Mask (Small)—North Safety Products—54501S

CBRN Mask with Canister (M/L)—North Safety Products—54501CBRN

CBRN Mask with Canister (S)—North Safety Products—54501SCBRN

CBRN Canister—North Safety Products—40CBRN

CBRN Storage bag—Made in USA—54BAG

APR Description: This configuration consists of a full facepiece (p/n 54501 or 54501S), a canister (p/n 40CBRN), a User's Instruction Manual (p/n 80754), anti-fog wipes (p/n 80944), a carry bag (p/n 54 BAG), and two poly-bags for facepiece and anti-fog storage. The North 54500 Series Gas Mask has two 40 mm (1.57 in) threaded connectors that accept a standard NATO/EN type threaded canister. This enables the user to choose one of the two inlet ports onto which a single CBRN canister would be attached. The other side is blocked with a removable plug. The 54500 Series Gas Mask is black with a scratch-resistant and impact-resistant lens, an internal oral/nasal cup to reduce fogging and a four-strap head harness assembly. CBRN canister description: The nonreflective black CBRN Canister will provide respiratory protection against most hazardous CBRN agents conceivably encountered in a terrorist incident provided there is sufficient oxygen present to support life. It does not provide protection from fire or carbon monoxide. The canister has a standard NATO/EN 40 mm type thread.

APR Application: Radiation and biological. There is a warning in the user instructions about atmospheres less than 19.5 % oxygen. The 54500 Series provides respiratory protection in non-IDLH environments against CBRN agents and Toxic Industrial contaminants.

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: The APR will protect against vapor, liquid, and aerosol forms of CAs, against particulate, aerosol, and liquid forms of BAs, against gaseous, vapor, aerosol, and liquid forms of TICs/TIMs, and against radiological particulates

Breathing Performance:

- **Inhalation Resistance:** Initial 60 mm H₂O. Canister airflow meets the military specifications of ≤ 55 mm water column when tested at 85 L/min continuous airflow.

- **Exhalation Resistance:** 12 mm (0.47 in)

Field of View: Average 96.3 %

Environmental Conditions: Do not expose this device during storage to excessive heat [above 71 °C (160°F)], moisture, or contaminating gaseous substances

Environmental Testing: Passed hot diurnal, cold constant, humidity, vibration, and drop tests

Faceblank Material: The face seal is made from a thermoplastic elastomer material

Canister Capabilities:

- **Canister Capacity Rating:** CAP 1
- **Canister Service Life:** The service life of the canister, if not contaminated, is rated for 8 yr. The respirator should not be used beyond 8 h after initial exposure to CAs to avoid possibility of agent permeation. If liquid exposure is encountered, the respirator should not be used for more than 2 h.

Chemical Specific Canisters: Ammonia—40 CBRN—2500 mg/m³—25/25 °C/%—12.5 mg/m³—64 L/min—>30 min

Chlorine—40 CBRN

Cyanogen chloride—40 CBRN—300 mg/m³—25/25 °C/%—2 mg/m³—64 L/min—>30 min

Cyclohexane—40 CBRN—2600 mg/m³—25/25 °C/%—10 mg/m³—64 L/min—>30 min

DMMP—40 CBRN—64 flow rate

Formaldehyde—40 CBRN—500 mg/m³—25/25 °C/%—1 mg/m³—64 L/min—>30 min

Hydrogen cyanide—40 CBRN—940 mg/m³—25/25 °C/%—4.7 mg/m³—64 L/min—>30 min

Hydrogen sulfide—40 CBRN—1000 mg/m³—25/25 °C/%—5 mg/m³—64 L/min—>60 min

Nitrogen dioxide—40 CBRN—200 mg/m³—25/25 °C/%—1 mg/m³ NO₂, 25NO—64 L/min—>30 min

Phosgene—40 CBRN—250 mg/m³—25/25 °C/%—1.25 mg/m³—64 L/min—>30 min

Phosphine—40 CBRN—300 mg/m³—25/25 °C/%—0.3 mg/m³—64 L/min—>30 min

Sulfur dioxide—40 CBRN—1500 mg/m³—25/25 °C/%—5 mg/m³—64 L/min—>25 min

Protection factor: 95 % of test subjects exceeded an LRPL of 5000. Fit factors ranged from 4469 to 58234 for the 8 test subjects when using the North 40CBRN canister. Fit factors ranged from 17420 to 68337 for the 8 test subjects when using the canister weighted to 500 g and sized to the maximum permissible dimensions.

DESIGN/CONFIGURATION

Visor: Single lens; visor is rigid. Visor contains coatings to enhance scratch resistance, reduce fogging, or perform other functions. Spectacle kit is available (part number 80100).

Visual Acuity: Eye test meets this performance criterion

Canister Design:

- **Canister Information:** One cartridge. P100 filter and 40 mm (1.57 in) DIN threads.
- **Canister dimensions:** cylinder 10.8 cm (4.25 in) diameter x 8.26 cm (3.25 in) high
- **Canister weight:** <300 g (10.58 oz)
- **Canister Location:** Direct connection to mask; right/left interchangeable. The other side is blocked with a removable plug.
- **Canister Mechanical Connection:** Has a standard Rd 40 x 1/7 thread

Gasket Mechanical Connection: Gasket is composed of ethylene propylene-diene-monomer (EDPM). Gasket material has been subjected to Gasket Test Methods required in the NIOSH CBRN APR Standard.

Facepiece Compatibility: Facepiece is NIOSH certified for use with an APR

Interoperability with Equipment: Not specified

HUMAN FACTORS

Communication: No voice amplifier. Speech intelligibility testing has been performed using NIOSH's test method.

Hydration: No capability

Sizes Available: Small, medium, and large. The 54500 Series is available in two overlapping sizes, small and medium/large.

Comfort/Weight: <800 g (1.76 lb)

Training: <8 h training (30 min), not provided by the manufacturer. The manufacturer will offer training services on a case-by-case basis. Users instructions state that training should be performed in small groups, typically five or less people, with a Safety Manager to ensure the user is trained in the proper use of respirators, including putting on and removing them. Such training should include an opportunity for the user to handle the respirator, learn how to inspect it, have it properly fitted, test its facepiece-to-face seal and wear it in an area with uncontaminated air to become familiar with it. Training time not expected to exceed 30 min. A respirator should not be assigned to a person unless the person is given a qualitative or quantitative respirator fit test and the results of the test indicate that the facepiece of the respirator fits properly. Instructions for carrying out qualitative and quantitative respirator fit tests are given in OSHA 29 CFR §1910.134, and respirator manuals published by government agencies such as NIOSH, ERDA, and NRC.

Manuals: Manual. Users instructions are included with every facepiece.

Color: Not color-coded

Don/Doff Information: 0 s to 30 s. Once a user is properly trained the donning and/or doffing time is less than 30 s.

LOGISTICS

Maintenance Required: All components of the respirator should be visually inspected prior to and after use. Maintenance normally consists of cleaning in warm water with a mild solution after use. Replacement parts consist of inhalation valves, exhalation valves, and canister connector gaskets

Use/Reuse: Equipment can be cleaned and reused with minimal effort. The respirator should not be used beyond 8 h after initial exposure to CAs to avoid possibility of agent permeation. If liquid exposure is encountered, the respirator should not be used for more than 2 h. Users Instructions state to “discard the respirator according to local regulations.”

Package Shape/Volume: Less than or equal to 0.028 m³ (1.0 ft³). Rigid (cardboard).

Shelf Life:

- **Shelf Life (Facepiece):** ≥ 5 yr—A similar respirator used in industrial applications has been available for 5 yr without any shelf life issues. Therefore, shelf life is >5 yr.
- **Shelf Life (Canister):** >5 yr—Shelf life for the canister is estimated to be >8 yr

Storage Conditions: Do not store respirators in temperatures >70 °C (158 °F) or <-30 °C (-22 °F); <90 % rh. Do not expose this device during storage to excessive heat [>71 °C (160°F)], moisture, or contaminating gaseous substances.

Sizes Available: Small, medium, and large. The 54500 Series is available in two overlapping sizes, small and medium/large.

Health Hazards and Safety: No health hazards

MSDS: MSDS is available

Warranty: North Safety Products warrants the 54500 CBRN Respirator to be free from defects in materials and workmanship. North’s only obligation under this warranty will be, at North’s option, to repair or replace without charge the apparatus or any of its components (except filters/cartridges) found by North to have been defective during the warranty period of 1 yr from the date of purchase by the owner.

GENERAL

Avon CBRN FM12 Respirator

Model: CBRN FM12

Avon Protection Systems
503 Eighth Street
Cadillac, Michigan 49601
John Bevans, Project Manager
231-779-6200 (Tel)
231-779-6202 (Fax)
john.bevans@avon-rubber.com

Information Source: Responder Knowledge Database
<http://www.avon-rubber.com>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnaapproved/apr/default.html#list>
Availability: In stock



NIOSH Status: CBRN Cap 1—Capacity meets a minimum 15 min test requirement

NIOSH CBRN Number: TC-14G-0275CBRN

Certification Date: 7/18/2005

Unit Cost: \$275

Component Cost: Call for pricing

Other Certifications: CE certified by TNO Netherlands to European PPE Directive 89/686/EEC. The mask has also been evaluated against the NATO Triptych by TNO Netherlands.

NIOSH 42CFR84 with AVON CT-12 and FM-12 full facepieces with 70010/20 cartridge
Certification number—84A-3931, December 12, 2002

Independent Testing: Independent testing carried out by a variety of organizations including ICS labs, Cleveland Ohio (Laboratory Protection Factor testing, lens transmission, abrasion, cold temperature fogging tests, breathing resistance tests, etc). RDECOM Edgewood has carried out live agent “Smartman” testing according to NIOSH CBRN standard. NIOSH has carried out rebreathed CO₂ testing. TNO Netherlands has carried out a full suite of testing in accordance with European standard EN136, including protection factor testing, CO₂, breathing resistance, practical performance, etc. All the above tests have been carried out within the 12 mo to May 2005.

Configuration: CBRN FM12 (3 sizes available), CBRNF12 filter, and prescription lens inserts (pair)

Configuration tested: AVON CT-12 and FM-12 full facepieces with 70010/20 cartridge (Part numbers for approved facepieces are 70046/1/1)

APR Description: FM12 is a full military specification NBC mask, constructed from agent-resistant chlorobutyl rubber. The facepiece is in 3 sizes. The front module includes the primary speech module for excellent speech transmission, the exhalation valve, and the drinks train with a dual valve and drinks tube allowing drinking from standard canteens and Camelbak type systems. The low-profile 6-point harness provides excellent comfort and compatibility with many in service helmet systems. Low-profile twin eyepieces ensure minimal eye relief, improving weapons sighting. The CBRNF12 filter provides broad-spectrum capability in accordance with the NIOSH CBRN standard.

APR Application: Avon meets military specifications in the categories noted (radiation and biological) but needs further clarification of what standards are assumed. The APR is most likely to be used by first responders to CBRN incidents, especially law enforcement and other federal officers. Also will be used for tactical response. The manufacturer does not provide specific guidance and warnings to users related to the use of the respiratory equipment in atmospheres with <19.5 % oxygen concentration. Detailed in instructions.

References: Military and government agencies in over 53 countries throughout the world—2 000 000 in use for over 10 yr. Contact Avon for more data.

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: The APR will protect against vapor, liquid, and aerosol forms of CAs, against particulate, aerosol, and liquid forms of BAs, and against radiological particulates

Breathing Performance:

- **Inhalation Resistance:** Less than 50 mm water
- **Exhalation Resistance:** Less than 15 mm water

Field of View: 65 %

Environmental Conditions: Not specified

Environmental Testing: Not specified
Faceblank Material: Avon proprietary—chlorobutyl rubber
Canister Capabilities:

- **Canister Capacity Rating:** CAP 1
- **Canister Service Life:** Not specified

Chemical Specific Canisters: Not specified
Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Double lens; visor is rigid. Visor contains coatings to enhance scratch resistance, reduce fogging, or perform other functions. Spectacle kit is available.
Visual Acuity: Not specified
Canister Design:

- **Canister Information:** One cartridge. 40 mm (1.57 in) DIN threads. Canister shape is cylinder.
- **Canister Location:** Direct connection to mask; right/left interchangeable
- **Canister Mechanical Connection:** Has a standard Rd 40 x 1/7 thread

Gasket Mechanical Connection: Not specified
Facepiece Compatibility: Facepiece is not NIOSH certified for use with a PAPR or SCBA, but facepiece can be used with PAPR and SCBA
Interoperability with Equipment: Not specified

HUMAN FACTORS

Communication: Not specified
Hydration: Has manufacturer-developed connector
Sizes Available: Small, medium, and large
Comfort/Weight: Total weight: 770 g (1.7 lb)
Training: Not specified
Manuals: Not specified
Color: Not specified
Don/Doff Information: 0 s to 30 s

LOGISTICS

Maintenance Required: Not specified
Use/Reuse: Not specified
Package Shape/Volume: Not specified
Shelf Life:

- **Shelf Life (Facepiece):** Not specified
- **Shelf Life (Canister):** Not specified

Storage Conditions: Not specified
Sizes Available: Small, medium, and large
Health Hazards and Safety: Not specified
MSDS: Not specified
Warranty: Not specified

GENERAL

3M™ FR-M40B**Model:** FR-M40B-10, FR-M40B-20, and FR-M40B-30

3M
 3M Center, Building 235-2W-70
 Saint Paul, Minnesota 55144-1000
 Geoff Betsinger
 800-243-4630 (Tel) Technical
 800-328-1667 (Tel) Sales
 651-736-7344 (Fax)
 gbbetsinger@mmm.com

Information Source: Responder Knowledge Database
<http://www.3m.com>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnaapproved/apr/default.html#list>



NIOSH Status: CBRN Cap 1—Capacity meets a minimum 15 min test requirement

NIOSH CBRN Number: TC-14G-0271CBRN

Certification Date: 3/15/2004

Unit Cost: \$318. FR-M40B (includes 2nd skin and eyepiece outserts).

Component Cost: Eyepiece outserts \$98, 2nd skin \$33, FR-15-CBRN \$175/case 4

Other Certifications: SEI—NFPA 1994 (2001 Edition)—DuPont Protective Apparel, Tychem CPF3, CBT-DUP-01—May 24, 2005

NIOSH Certification of 3M FR-M40 with FR-C2A1, TC-84A-3281, 3/27/2000

NIOSH certification of 3M FRM40, 6000, or 7000 with FR-64 cartridge, TC-84A-3717, September 18, 2001, or 42 CFR 84

Independent Testing: Not specified

Configuration: Facepiece—FR-M40-10 (Small), FR-M40-20 (Medium), FR-M40-30 (Large)

Second skin, butyl rubber—FR-M40-5 (Small), FR-M40-6 (Medium/Large)

Eyepiece outserts—FR-M40-1 (Clear), FR-M40-2 (Grey)

Canister—FR-15-CBRN

Configuration tested:

Facepiece, Small, part no. FR-M40-10

Facepiece, Medium, part no. FR-M40-20

Facepiece, Large, part no. FR-M40-30

CBRN Canister, part no. FR-15-CBRN

APR Description: The 3M™ Full Facepiece Respirator FR-M40 is designed to help provide respiratory protection against certain airborne contaminants when used in accordance with all use and limitation instructions and applicable safety and health regulations. When used with the 3M™ Eyepiece Outserts, Clear FR-M40-1 or 3M™ Eyepiece Outserts, Gray FR-M40-2; and 3M™ Second Skin, Small FR-M40-5 or 3M™ Second Skin, Medium/Large FR-M40-6; and 3M™ Canister FR-15-CBRN, it is NIOSH approved for use in chemical, biological, radiological, and nuclear (CBRN) environments.

APR Application: CBRN environments; not for use if oxygen <19.5 %

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: CBRN approved so CA, BA, TICs/TIMs, and radiological particulates

Breathing Performance:

- **Inhalation Resistance:** Measured value of airflow resistance at 85 L/min is <50 mm. One filter can be used without inhibiting the flow rate. The canister airflow meets the military specifications of ≤ 55 mm water column when tested at 85 L/min continuous air flow.
- **Exhalation Resistance:** <15 mm (0.59 in)

Field of View: Field of view—93.6 %

Environmental Conditions: Service life of the canister against organic vapors will be less in high rh environments

Environmental Testing: Passed hot diurnal, cold constant, humidity, vibration, and drop tests

Faceblank Material: Silicone—facepiece is made of a soft, conformable silicone material for user comfort. To protect the facepiece from chemical damage, an optional butyl rubber second skin is available.

Canister Capabilities:

- **Canister Capacity Rating:** CAP 1
- **Canister Service Life:** Once canister is opened, service life must be determined according to contaminant concentration, temperature, etc. 3M™ Service Life Software is available free at www.3m.com/occsafety, Technical data bulletin No. 162.

Chemical Specific Canisters: When used with the FR-64 cartridge the system can be used against most military and industrial materials

When used with the FR-C2A1 cartridge, the system can be used against acid gases, CN, CS, and as a P100 particulate filter

Ammonia*—FR-15-CBRN—2500 ppm—25 °C/25 % RH and 80 % RH—12.5 ppm—64 L/min—>15 min

Chlorine dioxide—FR-15-CBRN—500 ppm—25 °C/50 % RH—0.1 ppm—64 L/min—>30 min

Carbon Tetrachloride—FR-15-CBRN—1000 ppm—25 °C/50% RH—5 ppm—64 L/min—>25 min

Chlorine—FR-15-CBRN—500 ppm—25 °C/50 % RH—5 ppm—64 L/min—>17.5 min

Chloroacetophenone—FR-15-CBRN—16 ppm—25 °C/50 % RH—0.05 ppm—64 L/min—>480 min

Chlorobenzylidenemalononitrile—FR-15-CBRN—3 ppm—25 °C/50 % RH—0.05 ppm—64 L/min—>480 min

Chloropicrin—FR-15-CBRN—744 ppm—25 °C/80 % RH—0.74 ppm—64 L/min—>27 min

Cyanogen chloride*—FR-15-CBRN—300 ppm—25 °C/80 % RH—2 ppm—64 L/min—>15 min

Cyclohexane*—FR-15-CBRN—2600 ppm—25 °C/80 % RH—10 ppm—64 L/min—>15 min

DMMP—FR-15-CBRN—591 ppm—26 °C/dry—0.008 ppm—50 L/min—>59 min

Formaldehyde*—FR-15-CBRN—500 ppm—25 °C/80 % RH—1 ppm—64 L/min—>15 min

Hydrogen chloride—FR-15-CBRN—500 ppm—25 °C/50 % RH—5 ppm—64 L/min—>25 min

Hydrogen cyanide*—FR-15-CBRN—3618 ppm—25 °C/25 % RH and 80 % RH—4.5 ppm—64 L/min—>28 min

Hydrogen fluoride—FR-15-CBRN—70 ppm—25 °C/50 % RH—3 ppm—64 L/min—>30 min

Hydrogen sulfide*—FR-15-CBRN—1000 ppm—25 °C/50 % RH—10 ppm—64 L/min—>30 min

Methylamine—FR-15-CBRN—1000 ppm—25 °C/50 % RH—10 ppm—64 L/min—>12.5 min

Nitrogen dioxide*—FR-15-CBRN—200 ppm—25 °C/25 % RH and 80 % RH—1 ppm—64 L/min—>15 min

Phosgene*—FR-15-CBRN—4943 ppm—25 °C/50 % RH—2 ppm—64 L/min—>25 min

Phosphine*—FR-15-CBRN—1500 ppm—25 °C/50 % RH—0.3 ppm—64 L/min—>12 min

Sulfur dioxide*—FR-15-CBRN—1500 ppm—25 °C/25 % RH and 80% RH—5 ppm—64 L/min—>15 min

Protection factor: Passed CBRN testing. Range of LRPLs measured across all subjects: 5 to 100 000. Average = 75470; n = 76.

DESIGN/CONFIGURATION

Visor: Double lens; visor is rigid. Spectacle kit is available.

Visual Acuity: Not specified

Canister Design:

- **Canister Information:** One cartridge. P100 filter and 40 mm (1.57 in) DIN threads. Canister dimensions: cylinder 11 cm (4.33 in) diameter x 7.6 cm (2.99 in) high. Canister weight: 335 g (11.82 oz).
- **Canister Location:** Direct connection to mask; right/left interchangeable (cartridge can be mounted on either side of the facepiece)
- **Canister Mechanical Connection:** Has a standard Rd 40 x 1/7 thread

Gasket Mechanical Connection: Gasket is composed of ethylene propylene-diene-monomer (EDPM)

Facepiece Compatibility: Facepiece is NIOSH certified for use with an APR

Interoperability with Equipment: Compatible same as with M40 mask

HUMAN FACTORS

Communication: No voice amplifier. Speech intelligibility testing has been performed using NIOSH's test method (overall performance rating 79.6 %).

Hydration: Recommended canteen: Military or Camelbak. Compatible with standard M1 canteen cap. Use drinking tube without removing facepiece (drinking tube may only be used in nonhazardous environments.)

Sizes Available: Small, medium, and large

Comfort/Weight: Total weight as worn: 1100 g (2.45 lb) (includes second skin, eyepiece outserts, and canister)

Training: Training time depends on person; 3M™ Respirator e-Training takes 25 min to 65 min. Written respiratory protection program materials available on request.

Manuals: Manual is available

Color: Not color-coded

Don/Doff Information: Not specified

LOGISTICS

Maintenance Required: Before and after each use

Use/Reuse: Equipment can be cleaned and reused with minimal effort. Procedures are available to decontaminate and/or dispose of used equipment.

Package Shape/Volume: Less than or equal to 0.028 m³ (1.0 ft³). Rigid (cardboard).

Shelf Life:

- **Shelf Life (Facepiece):** Not specified
- **Shelf Life (Canister):** ≥ 5 yr

Storage Conditions: Recommend storage in cool clean environment

Sizes Available: Small, medium, and large

Health Hazards and Safety: Head straps contain latex

MSDS: MSDS is available

Warranty: 3M will replace or refund the purchase price of any OH&ESD product found to be defective in material, manufacture, or not in conformance with any express warranty. This warranty is exclusive and in lieu of any implied warranty of merchantability or fitness for a particular purpose. **Limitation of liability:** Except as provided above, 3M shall not be liable or responsible for any loss or damage, whether direct, indirect, incidental, special or consequential arising out of the sale, use or misuse of 3M OH&ESD products, or the user's inability to use such products. These remedies set forth herein are exclusive.

GENERAL

Scott CBRN/M110 Air Purifying Respirator

Model: CBRN/M110

Scott Health and Safety
4320 Goldmine Road
Monroe, North Carolina 28110
Greg Gatlin
704-291-8407 (Tel)
704-291-8420 (Fax)
ggatlin@tycoint.com



Information Source: Responder Knowledge Database
<http://www.scotthealthsafety.com>
http://www.cdc.gov/niosh/npptl/topics/respirators/cbrna_approved/apr/default.html#list

NIOSH Status: CBRN Cap 1—Capacity meets a minimum 15 min test requirement

NIOSH CBRN Number: TC-14G-0283CBRN

Certification Date: June 2006

Unit Cost: Not specified

Component Cost: Not specified

Other Certifications: CE and NATO

Independent Testing: TNO; NATO compliance

Configuration: Scott CBRN/M110 Air Purifying Respirator certified to NIOSH CBRN-APR Standard for CBRN Full Facepiece Air Purifying Respirators
C420 PAPR—Safety Tech

Proflow 2 and 3 PAPR's—Scott Health and Safety

HE/P100 canister (CE)—Scott Health and Safety

Enforcement can—Scott Health and Safety

APR Description: Two-piece construction of hypoallergenic, halobutyl rubber mask and silicone nose cup materials, provides the user maximum comfort and excellent permeation resistance to a wide variety of toxins. Has a sleek, low profile design and a dual lens for increased field of vision. Provides protection for response to demonstration, riots, or crowd control, as well as meth lab cleanup and white powder responses. The M110 Dual Lens CBRN facepiece was designed with maximum user comfort in mind, knowing that the situations in which they will be used can require long-term responses. Textile head harness for superior fit and quick donning, and six-point, easily adjustable head harness for quick and easy donning.

APR Application: The Scott M110 Dual Lens CBRN facepiece is ideal for police, security SWAT teams, and military personnel for CBRN-approved air-purifying respiratory protection in combat, riot control, or other tactical situations. The M110 Dual Lens CBRN facepiece offers rapid deployment, simple disinfection and decontamination, and easy maintenance.

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: CBRN approved

Breathing Performance:

- **Inhalation Resistance:** Canister airflow meets the military specifications of ≤ 55 mm water column when tested at 85 L/min continuous airflow.
- **Exhalation Resistance:** Not specified

Field of View: FOV—84 %. Binocular lens provides unobstructed field of vision.

Environmental Conditions: Not specified

Environmental Testing: Not specified

Faceblank Material: The facepiece is made of a soft, conformable silicone material for user comfort

Canister Capabilities:

- **Canister Capacity Rating:** CAP 1
- **Canister Service Life:** Not specified

Chemical Specific Canisters: CBRN-approved when used with Scott's CBRN Cap-1 Canister. NIOSH 42 CFR approved when used with Scott's Enforcement Cartridge, MPC Plus Cartridge or P100 Cartridge.

Test Concentration (PPM)—Breakthrough Concentration (PPM)

Ammonia—2500 ppm—12.5 ppm

Cyanogen chloride—300 ppm—2 ppm

Cyclohexane—2600 ppm—10 ppm

Formaldehyde—500 ppm—1 ppm
Hydrogen cyanide—940 ppm—4.7 ppm(1)
Hydrogen sulfide—1000 ppm—5.0 ppm
Nitrogen dioxide—200 ppm—1 ppm NO₂ or 25 ppm NO₂
Phosgene—250 ppm—1.25 ppm
Phosphine—300 ppm—0.3 ppm
Sulfur dioxide—1500 ppm—5 ppm

(1) Sum of HNC and C₂N₂

(2) Nitrogen dioxide breakthrough is monitored for both NO₂ and NO. The breakthrough is determined by which quantity, NO₂ or NO, reaches breakthrough first. Time for breakthrough for CBRN APR negative pressure is a minimum of 15 min.

Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Double lens facepiece:

- Lens material: Hard coated, impact-resistant polyamide lens resists scratching
- Head harness: textile
- Facepiece: Halobutyl
- Nosecup: Silicone

Visual Acuity: Not specified

Canister Design:

- **Canister Information:** Dual 40 mm canister ports allow for canister to be mounted left or right side for proper weapon sighting
- **Canister Location:** Dual 40 mm canister ports allow for canister to be mounted left or right side for proper weapon sighting (factory set)
- **Canister Mechanical Connection:** Dual 40 mm canister ports

Gasket Mechanical Connection: Not specified

Facepiece Compatibility: This NATO compliant face piece is currently NIOSH approved as an APR and with multiple PAPR approvals

Interoperability with Equipment: Spectacle kit; optional drinking bottle; speech diaphragm; tactical facepiece bag with belt mounting; shoulder strap for tactical facepiece bag; leg strap for tactical facepiece bag; and fleece facepiece bag

HUMAN FACTORS

Communication: Optional speech diaphragm provides optimal communications

Hydration: Optional drinking port allows for easy fluid intake

Sizes Available: Small and large

Comfort/Weight: Total weight: 1320 g (2.9 lb)

Weight:

- Mask with canister: 860 g (1.9 lb)
- Mask only: 460 g (1.01 lb)

Canister:

- Weight: 410 g (0.9 lb); weight in packaging: 550 g (1.2 lb)
- Height: 10.4 cm (4.11 in)
- Diameter: 11.0 cm (4.33 in)

Training: Not specified

Manuals: Not specified

Color: Not specified

Don/Doff Information: Not specified

LOGISTICS

Maintenance Required: Easy disinfection, decontamination, and maintenance

Use/Reuse: Not specified

Package Shape/Volume: Packaging material: Polypropylene with a magnetic induction seal

Shelf Life:

- **Shelf Life (Facepiece):** Shelf-life: 7 yr stored in original packaging
- **Shelf Life (Canister):** Not specified

Storage Conditions: Easily folded flat for storage

Sizes Available: Small and large

Health Hazards and Safety: Hypoallergenic, halobutyl material provides maximum user comfort and excellent resistance against CBRN agents and toxic materials

MSDS: Not specified

Warranty: Scott warrants the M110 CBRN facepiece to be free from defects in workmanship and material for a period of 1 yr from the date of shipment by Scott

APPENDIX L—PAPR DATA FIELDS

APPENDIX L—PAPR DATA FIELDS

Fifty-five data fields were used to provide information relating to PAPRs. The 55 data fields are comprised of data fields from the market survey vendor questionnaire requesting specifics about their PAPRs. All data fields from the market survey were developed using input from the emergency responder community. Because of the database limitations, several data fields on the vendor questionnaire were combined, but all the vendor-supplied information was entered into the database.

The data sheets are grouped according to the following five parameters and the number of data fields in each parameter:

- General (15 data fields).
- Operational Capabilities (11 data fields).
- Design/Configuration (12 data fields).
- Human Factors (5 data fields).
- Logistics (12 data fields).

1.0 General

1.1 Product Information

Product information, including name, model, and/or stock number, is used to identify the PAPR. The stock and/or model number indicates the number(s) that are used to uniquely identify the equipment. It should include the stock identification or national stock number, if the PAPR has one.

1.2 Manufacturer Information

This data field identifies the company that manufactured the PAPR (to include the name, address, telephone and FAX number, point of contact, email address, and manufacturer website).

1.3 Source

Source indicates where the PAPR information was obtained. Potential sources include past market surveys, internet websites, conferences, or commerce business daily announcements.

1.4 Last Updated

This data field provides the date when the manufacturer/vendor last updated the information.

1.5 NIOSH CBRN Certification

Although the NIOSH CBRN standards have not been finalized, many PAPRs have met the initial minimum requirements of approval under NIOSH 42 CFR Part 84. Special requirements for

CBRN PAPR certification include enhanced performance criteria for field of view, lens abrasion resistance, simulated carbon dioxide inhalation testing, canister gas life testing, fogging resistance, communications, resistance to chemical warfare agent (CWA) penetration and permeation, facepiece fit factor testing, and environmental conditioning. NIOSH CBRN requirements can be found in 42 CFR, Part 84, Subparts A, B, D, E, F and G; 42 CFR, Part 84, Subpart I, Paragraphs 84.110–123; 42 CFR, Part 84, Subpart K, Paragraphs 84.170, 179, and 181; and 42 CFR, Part 84, Subpart KK.

1.6 Certification as an Assembly

The complete PAPR assembly and subassemblies should be composed only of those component parts that the manufacturer plans to submit for CBRN approval for each specific approval.

1.7 Other Certifications

Other applicable testing and certifications include testing organization(s) and standard(s) such as mil-standards.

1.8 Independent Testing Information

This data field includes any test data obtained from sources regarding any part of the equipment (e.g., validation testing including materials and ensemble testing such as abrasion, tear, wear, burst, and permeation testing). Human factors testing results should be included as well (either quantitative or qualitative).

1.9 PAPR Description

The description category provides an overall description of the PAPR and any features that make the PAPR unique.

1.10 PAPR Application

This data field identifies the areas where the PAPR is most likely to be used per vendor or manufacturer recommendation (e.g., tactical operations, crisis management, etc.), or those areas where the PAPR should not be used (i.e., in a flammable environment, etc.).

1.11 PAPR Restrictions

This data field indicates whether the manufacturer provides specific guidance and warnings that relate to the use of the respiratory equipment in IDLH atmospheres or in atmospheres with less than 19.5 % oxygen concentration.

1.12 EOD Compatibility

This data field indicates the ability of the respiratory equipment to be used with an EOD protective ensemble or protective bomb suit. For example, a CB protective ensemble and respirator are required to be worn with an EOD ensemble in a CB threat environment.

1.13 Unit and Component Cost (MSRP)

Costs include details on the complete respiratory system cost, as well as individual components (e.g., canisters, cartridges, blower, batteries, etc.) costs.

1.14 Availability

Availability indicates the lead time for acquiring initial quantities of the PAPRs after the order has been placed, as well as repair and maintenance parts. Provide if the equipment is disposable or nondisposable.

1.15 References/User(s) of Product

*This data field identifies organizations (i.e., military use, commercial applications, civil-service instrument, etc.) that are currently using the piece of equipment. This information may include the average number of units each client has in operation and the average number of years these units have been in use. **References must be verified with consent from the users before including the contact information.***

2.0 Operational Capabilities

2.1 Hazard/Threat Protection Categories

This data field provides references to the protection capability of the respiratory equipment to protect against CWAs, BWAs, TICs/TIMs, and radiological particulates.

2.2 Breathing Performance

The concept paper for the CBRN standard allows for certification of PAPRs with either moderate or high breathing rate performance. PAPRs designated for the moderate breathing rate will be tested at a minute volume of 40 L/min. PAPRs designated for the high breathing rate will be operated at a minute volume of 103 L/min. The desired breathing performance is dependent on the mission type and expected work rate.

2.3 Airflow Resistance

Airflow resistance for breath responsive PAPRs will be evaluated under the requirements of 42 CFR 84, subpart J, Sec. 84.157, for pressure-demand supplied air respirators. The pressure in the facepiece shall not fall below atmospheric at inhalation airflows less than 115 L (4 ft³)/min for tight-fitting facemasks and 170 L (6 ft³)/min for loose-fitting.

2.4 Inhalation Resistance

Inhalation resistance is the ease at which a PAPR wearer can breathe air. Requirements of 42 CFR 84, subpart J, Sec. 84.157 state that the static pressure in the facepiece shall not exceed 38 mm (1.5 in) of water-column height.

2.5 Exhalation Resistance

Exhalation resistance is measured at a constant flow rate of 85 L/min. The draft NIOSH PAPR CBRN standard requires an exhalation resistance of less than 20 mm H₂O at 85 L/min. The military specification for the M40 requires an exhalation resistance less than 26 mm H₂O.

2.6 Environmental Conditions

The NIOSH CBRN standard has minimum requirements for environmental testing. Different environments may affect the efficacy of the material. Some climates are extremely cold, some are hot and dry, others are hot and humid, and some can change from hot to cold, or cold to hot, within one mission. This data field provides specific guidance or recommendations related to the use of the respiratory equipment in high heat and humidity environments. It also indicates if the mask/canister has been subjected to the environmental tests referenced in the APR CBRN standards in the following list:

- Hot diurnal test method: Mil-Std-81°F; Method 501.4; Table 501.4-II.
- Cold constant test method: Mil-Std-81°F, Method 502.4.
- Humidity test method: Mil-Std-810E, 507.3; Method 507.3; Table 507.3-II.
- Vibration test method: Mil-Std-810F, 514.5.
- Drop test method: 3 foot drop onto bare concrete surface.
- Other conditions that may degrade canister performance (i.e., aerosol penetration, gas life, airflow resistance, etc.).

2.7 Chemical Specific Canister Options

*CBRN PAPR Concept Paper considers the availability of NIOSH-approved canisters for specific TICs such as chlorine. This field will also address what, if any, optional canisters are certified with a particular mask. This data field will provide information relating to testing that has been completed on the canister with specific challenge chemicals, including, **ammonia**, chlorine, cyanogen chloride, cyclohexane, DMMP, formaldehyde, hydrogen cyanide, hydrogen sulfide, nitrogen dioxide, phosgene, phosphine, and sulfur dioxide. Testing data will include **Canister ID**, **Challenge Concentration (mg/m³)**, **T/RH (°C/%)**, **Breakthrough Concentration (mg/m³)**, **Flow Rate (L/min)**, and **Normalized Gas Life (min)**. Note: The challenge chemicals in bold represent the 10 test representative agents from the NIOSH PAPR CBRN standard.*

2.8 Canister Capacity Rating

The CBRN concept paper specifies minimum requirements for six different canister capacities: (1) 15 min, (2) 30 min, (3) 45 min, (4) 60 min, (5) 90 min, and (6) 120 min. The capacity times represent the minimum required gas life at the test conditions specified in the CBRN standard.

The challenge concentrations used during certification testing are above IDLH. Since PAPRs are only permitted for use in hazards below IDLH, the capacity categories do not represent actual use times, which will be dependent on the hazard type, hazard concentration, and environmental conditions. This criterion will compare the maximum capacities of the approved canisters for the various respirators. Multiple canisters would allow the user to tailor the canister capacity to the specific mission. CBRN PAPR canister useful service life is based on the canister capacity rating: Cap 1, 2, 3, 4, 5, or 6.

2.9 Chemical Test Representative Agents

Minimum filter canister capacity is 15 min at gas concentrations based on three times immediately dangerous to life or health (IDLH) concentrations. The proposed standard allows for stacking additional hazard protection of one or more of the chemical test representative agents (TRA). Include the specific TRA and the increased durations of protection (i.e., 30 min, 45 min, 60 min, 90 min, or 120 min) if the system offers additional performance for one or more of the TRAs.

2.10 Canister Service Life

Service life of the canister will consider the fielded life of the canister or the life of a canister in a “cold zone.” The fielded life will be defined as the number of days after opening the packaging that the canister can be used before replacement is recommended, assuming that it has not been exposed to a contaminated environment. Indicate if the manufacturer provides any tools for estimating canister service life and the effects of temperature/relative humidity on canister performance.

2.11 Protection Factor

This data field addresses the ability of the respirator to effectively seal to the wearer. The information is based on the results of the Laboratory Respiratory Protection Level (LRPL) testing per the NIOSH test method. The CBRN standard contains minimum requirements for LRPL. This test is performed with a panel of human subjects with a variety of facial sizes. The subjects don the mask and enter a chamber containing a corn oil aerosol challenge. The subjects perform a series of exercises while the in-mask aerosol concentration is measured permitting determination of the LRPL (Standard Test Procedure (STP) as prescribed in 42 CFR, Part 84, Subpart G, Section 84.63(a), (c), & (d); Federal Register, Volume 60, Number 110, June 8, 1995). This data field will include if the manufacturer has performed LRPL testing on the mask at the U.S. Army’s Protection Factor Test Facility, and the percentage of test subjects that exceeded the LRPL minimum requirement of 2000.

3.0 Design/Configuration

3.1 Facepiece

This data field also indicates the PAPR design, tight-fitting like a conventional mask or loose-fitting like a hood.

3.2 Visibility

Visibility includes visual acuity and impact on the field of view (FOV) as a percentage of visibility that the user has while wearing a respirator. Visual acuity for a person with 20/20 vision, either corrected or uncorrected, should be at least 20/35 while looking through a lens; an expected FOV is at least 70 % while looking through a lens. The data field will also provide the visual field score (VFS) as determined using the NIOSH APR CBRN standard.¹

3.3 Field of View

Visibility includes visual acuity and impact on the field of view as it applies while looking through a visor. The type of lens can also affect visibility. This data field will indicate the field of view as a percentage of visibility that the user has while wearing a respirator. An expected field of view is at least 70 % under these conditions. The data field will also provide the visual field score (VFS) as determined using the NIOSH PAPR CBRN standard.²

3.4 Facepiece Compatibility

This data field will indicate the ability to use the PAPR facepiece with other types of respirators, such as an APR or SCBA. It will also indicate whether the mask can be used for multiple platforms or if separate masks, even if identical, are required for each platform.

3.5 Blower Hose/Mask Interface

The interface between the mask and delivery hose from the blower could include the left or right cheek, center, or rear mounted. Consideration should be given to the mounting location to ensure that it does not interfere with other equipment.

3.6 Blower Mounting Options

The number and types of potential locations for mounting the blower to the user could include a vest, belt, or other attachment. Blowers that can be mounted in multiple configurations would allow the user flexibility to tailor to mission or protective ensemble.

3.7 Blower Weight/Profile

The total weight of the blower includes the weight of the batteries and associated canisters. The total weight should be considerably less than an SCBA set-up.

¹ NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0314

² NIOSH Standard Test Procedure CET-PAPRS-STP-CBRN-0314

3.8 Battery Life

This data field indicates the length of time it takes to recharge the battery, and if there is a fast recharge option. This data field should include the battery life at the highest rated flow of the PAPR under moderate environmental conditions (25 °C).

3.9 Battery Type

This data field indicates what type of battery is supplied with the blower. The data field will include if batteries are disposable or rechargeable, and the flexibility of the battery (i.e., can they be interchanged with rechargeable batteries and can they be easily swapped out in the field). Also, indicate if the blower can use batteries that are inexpensive and readily available from any retail store, or if the batteries are manufacturer-specific batteries.

3.10 Canister Configuration

This data field indicates the number of canisters that can be mounted to the blower, the means by which the canister mounts to the blower, and the ease of canister change-out. Multiple canisters would allow the user to tailor the canister capacity to the specific mission.

3.11 Interoperability with End User Equipment

This data field considers the number and types of equipment that can be used with the PAPR. Examples of end user equipment include head lamps and active communication equipment.

3.12 Indicators and Alarms

The CBRN concept paper specifies the PAPR must be equipped with a low battery indicator that alerts the user when 15-min but not more than 45-min of operational battery life remains, as well as a low flow indicator that alerts the user when airflow in the breathing zone reaches the minimum flow to maintain positive pressure. The indicator can be active or passive including vibratory, audible, and/or visible. This data field will consider the type of alarm (i.e., single or combination), as well as location of the alarm.

4.0 Human Factors

4.1 Communications Interface Capability

The concept paper has a minimum requirement for speech intelligibility. All CBRN-approved models must meet a minimum requirement for passive communication (without the aid of electronic communication or extended devices). However, since blower noise interferes with hearing, this criterion refers to the availability of a voice amplifier to enhance communication. Any accessory must be included on the CBRN approval for use.

Communications interface capability refers to the ability of the ensemble to interface with a communications system (network capability; hardwire capability; RF communication, etc.).

4.2 Hydration Capability (Optional, but must be liquid tight)

NIOSH CBRN standard permits approval of respirators equipped with hydration systems. The hydration system can be used during training exercises but is not permitted for use in the hot zone. Although hydration capability is considered an enhanced capability, factors that affect hydration include location of the mission, type of mission, length of mission, and the life of other equipment in use. This criterion will compare respirators with and without an integrated drink system interface.

4.3 Sizes Available

This data field refers to the variety of facepiece sizes available to the first responder community. There should be enough sizes to adequately fit most of the members of the response team, both male and female (XS).

4.4 Don/Doff Information

This data field indicates length of time required to don or doff the respirator. Although donning is not as critical for the mission (unless of an emergency) doffing time is especially important in decontamination operations. The speed and ease of removing the equipment from oneself as well as those rescued from contaminated areas may be critical. The ease of donning and doffing will be evaluated based on mask design. In addition, qualitative assessments will be made by the users during the hardware assessment.

4.5 Comfort/Weight

Comfort of the PAPR ensemble is based on the fit of the facepiece and the weight distribution of the PAPR system (i.e., blower, hoses, etc.). Weight indicates the weight of each component associated with the respirator and the total weight of the working equipment/system (as worn).

5.0 Logistics

5.1 Training

This data field refers to training available from the manufacturer. This includes any initial training and recertification training that is available. Training considers initial outfit testing and the man hours required to get certification to use the equipment. The availability of sustained training for the unit, annual or periodic, is also part of training criterion.

Indicate if your organization stresses to potential customers the importance of developing a written respiratory protection program that must be implemented in meeting all the requirements of OSHA 29 CFR 1910.134, including training, medical evaluation, and fit testing.

5.2 User Instruction Manual

An instructions manual must be used in conjunction with the matrix-style label for the cartridge to define the approved configuration. User instructions include a PAPR canister approval label with CBRN Cap 1 protection or it is included in the packaging.

5.3 Maintenance Requirements

This data field includes the services and parts required to keep the system at its peak operational readiness (e.g., preventative maintenance). This is important for PAPR systems for maintaining battery performance during storage. Following each use, respirators should be cleaned, disinfected, and stored according to the manufacturer's instructions. Indicate whether maintenance instruction is provided by hard copy or electronically.

5.4 Maintenance Cost

This data field indicates the cost required to maintain the system at its operational readiness. This cost will be based on equipment usage rates (i.e., cartridges, hoses, cylinders, etc.).

5.5 Use/Reuse

This data field indicates the need for any part of the equipment to be discarded after use or its ability to be reused. Provide the availability of procedures to decontaminate and/or dispose of the equipment if it were used in a contaminated environment.

5.6 Shelf Life

Shelf life for PAPR stock items would be similar to the shelf life of a Level A ensemble. Shelf life should be in terms of years, or fractional years.

5.7 Storage Conditions

Storage conditions include the recommended storage environment for the PAPR, as well as any factors that decrease shelf life (e.g., UV, critical temperature).

5.8 Packaging, Volume, and Shape

The package size and volume data field provides the external dimensions of the respirator and components when packaged (for storage and transportability). Package shape is also important when considering storing and transporting the PAPR. Requirements may differ if the product package will be stored in a warehouse or on a vehicle.

5.9 Health Hazards and Safety

This data field includes materials that possess a potential health hazard. An example of potential health hazard is the use of latex, an allergen.

5.10 Material Safety Data Sheet

An MSDS is required if any of the materials used to manufacture the equipment possess a potential health hazard. Indicate if an MSDS is available for the materials or for any of the chemicals in the cartridges.

5.11 Color

This data field indicates if the equipment is color-coded for a specific job type or role, or if the equipment has camouflage capability (signature reduction).

5.12 Warranty

Warranty is the length of time PAPR is guaranteed by the manufacturer, including the terms of the warranty (parts and labor). This data field also includes specific details on what is covered in the warranty, along with the effective lifetime of the warranty, any restrictions in place by the manufacturer, the specific parts and labor that are covered, and the expected useful lifetime of the equipment.

APPENDIX M—PAPR INDEX AND DATA SHEETS

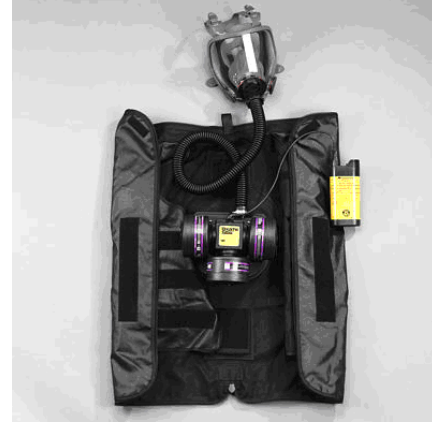
APPENDIX M—PAPR INDEX AND DATA SHEETS

ID#	Name	Manufacturer	Page M-#
1	3M™ 6000 RRPA System	3M	M-1
2	Bullard PA40 Spectrum for First Responder and First Receiver	Bullard	M-5
3	Global Secure FR2 First Responder PAPR	Global Secure Safety	M-8
4	MSA OptimAir® 6A PAPR	Mine Safety Appliances Company	M-11
5	The SEA Group SE 400 and SE 46	Safety Equipment of America (The SEA Group)	M-13
6	SafetyTech International C420 PAPR	SafetyTech International, Inc.	M-17
7	Scott Proflow 3	Scott Health & Safety	M-19
8	First Line Technology TST/SWEDE Butyl PAPR	First Line Technology, LLC.	M-21
9	3M™ Breathe Easy™ 10 Butyl Rubber Hood PAPR System	3M	M-23
10	ILC Dover First Receiver™ and Sentinel XL™	ILC Dover, Inc.	M-26
11	MSA OptimAir® 6HC PAPR	Mine Safety Appliances Company	M-28
12	TVI Corporation PureAir PAPR C8 PAPR System	TVI Corporation	M-30
13	Global Secure FR3 First Responder PAPR	Global Secure Safety	M-32
14	TVI Corporation PureAir PAPR K7 PAPR System	TVI Corporation	M-35

GENERAL

3M™ 6000 RRPA System**Model:** FR40L68, FR40N68, FR40L69, FR40N69, FR57L68, FR57N68, FR57L69, and FR57N69

3M
 3M Center
 Building 235-2W-70
 Saint Paul, Minnesota 55144-1000
 POC: Erik Johnson and Geoff Betsinger
 800-243-4630 (Tel) Technical
 800-328-1667 (Tel) Sales
 651-736-7344 (Fax)
 gbbetsinger@mmm.com
 occsafety@mmm.com

Source of Information: <http://www.3m.com>**Availability:** In stock—lead time is weeks**NIOSH Status:** TC-23C-2072 (basic 42 CFR Part 84 approval)**Unit Cost (MSRP):** \$1209

Component Costs: Turbo PAPR—\$330
 RRPAS bag vest—\$250
 6X00 facepiece—\$630
 Airflow indicator—\$21
 Lithium battery—\$250
 NiCad battery—\$250
 Breathing tube—\$87
 FR40—\$21 ea
 FR57—\$25 ea

Other Certifications: Product is certified by NIOSH under 42CFR Part 84. Submissions will follow standard finalization.**Independent Testing:** Cartridges tested to U.S. MIL-C-51560(EA), NATO Triptych AC/225 (Panel VII)D/103, QSTAG 1009**Configuration:** Submission status is unknown at this point

PAPR Description: PAPR consisting of facepiece, breathing tube and clamps, bag/vest, turbo motor blower unit, belt, battery pack options (lithium and NiCad batteries), airflow indicator, and three combination cartridges/filters. A powered air purifying respirator (PAPR) system that is stored in a unique carrying bag that transitions into a vest with a PAPR in place and ready to use. FR-57L 68/69 include a lithium battery with a 10 yr shelf-life, and either the 3M™ 6800DIN or 6900DIN Full Facepiece. FR-57N 68/69 include a rechargeable NiMH battery with either 3M™ 6800DIN or 6900DIN Full Facepiece. Can be used against organic vapors, sulfur dioxide, hydrogen chloride, chlorine, chlorine dioxide, hydrogen fluoride, ammonia, methylamine, formaldehyde and as a high efficiency particulate filter (HEPA). It is also designed to filter all known warfare agents.

PAPR Application: Use of this respirator in atmospheres for which it was not NIOSH certified or designed may result in sickness or death. Do not wear this respirator where atmospheres are oxygen deficient, contaminant concentrations are unknown, contaminant concentrations are IDLH, or where contaminant concentrations exceed the assigned protection factor (APF) recommended for the applicable headpiece or the APF mandated by specific government standards, whichever is lower. Refer to the user instructions provided with the applicable headpiece.

EOD Capability: PAPR is EOD compatible

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: All forms of CAs, BAs, TICs/TIMs, and radiological particulates**Breathing Performance:**

- **Inhalation Resistance:** Moderate work rate (conventional). 4 ft³ to 15 ft³ per min depending on respirator inlet cover. Measured value of airflow resistance: 40 mm to 50 mm water. Canister has one filter. Inhalation resistance in the unblown configuration (i.e., blower fails) is 70 mm water.
- **Exhalation Resistance:** Measured value of airflow resistance is <20 mm H₂O

Environmental Conditions: Service life of the canister against organic vapors will be less in high rh environments

Environmental Testing: Common environmental conditions found in the field. Cold weather testing is no longer a requirement in current CBRN Draft. However, cold testing will be performed to manufacturer's claims.

Hot diurnal—product is tested to current requirements of 42CFR Part 84

Cold Constant—product is tested to current requirements of 42CFR Part 84

Humidity—product is tested to current requirements of 42CFR Part 84

Vibration—product is tested to current requirements of 42CFR Part 84

Drop—not tested

Canisters:

- **Canister Information:** Has 3 cartridges. Canisters contain high efficiency filters. N/R/P 95/100 terminology is for negative pressure respirators only. Has 40 mm DIN threads. Canister volume is 915 cc.
- **Canister Capacity Rating:** Product meets 42CFR Part 84 requirements. Refer to data contained in canister information.
- **Canister Service Life:** Cartridges have a 5 yr shelf life when they remain unopened. 3M recommends that the canisters remain unopened until use. Users can determine service life using software developed by 3M. Service life is difficult to determine when concentrations and environmental conditions are not known. The useful service life of chemical cartridges will depend on the rate of airflow through the cartridges, specific type, volatility, and concentration of the contaminants; and environmental conditions, such as humidity and temperature. Replace cartridge/filter combination in accordance with an established change schedule or filter time-use restrictions, whichever occurs first. Cartridges should be changed immediately if smell, taste, or irritation from contaminant is detected. Filters must be replaced immediately if they become damaged, soiled or if increased resistance occurs. Provided on website www.3m.com/occsafety/html/cartridgechange.html.

Chemical Specific Canisters: #154, March 2002 Test Criteria for the 3M™ Canister FR-40 against various military and industrial chemical agents

3M's FR-40 canister has been tested against military and NIOSH protocol and found to be effective against a number of different CAs and industrial chemicals

The FR-40 canister contains a high efficiency filter to remove solid and liquid aerosols. It also contains activated and impregnated carbon to absorb or react with gases and liquid vapors.

Ammonia (NH₃)—3480 mg/m³—50 % rh—34.8 mg/m³—12 min—17.4/348 mg/m³—348 mg/m³

Carbon tetrachloride (OV)—31 460 mg/m³—50 % rh—31.5 mg/m³—12 min—31.5/1888 mg/m³—1888 mg/m³

Chlorine (Cl₂)—14500 mg/m³—50 % rh—14.5 mg/m³—12 min—1.5/87.0 mg/m³—87 mg/m³

Chloropicrin (PS)—5000 mg/m³—80 % rh—5.0 mg/m³—27 min—0.67/26.9 mg/m³—26.9 mg/m³

Cyanogen chloride (CK)—2000 mg/m³—80 % rh—2.5 mg/m³—25 min—0.75C/ND(118) mg/m³—118 mg/m³

DMMP—3000 mg/m³—Dry—0.04 mg/m³—59 min—NA—NA

Hydrogen chloride (HCl)—746 mg/m³—50 % rh—7.5 mg/m³—12 min—7.5C/149 mg/m³—149 mg/m³

Hydrogen cyanide (AC)—2000 mg/m³—80 % rh—1.0 mg/m³—25 min—5.2C/55.3 mg/m³—55.3 mg/m³

o-Chlorobenzylidene-malononitrile (CS)—23.1 mg/m³—50 % rh—0.39 mg/m³—480 min—0.39C/1.9 mg/m³—1.9 mg/m³

Particulates (High Efficiency)—100 mg/m³—NA—<0.03 % mg/m³—NA—10 I/ND 3 R/ND mg/m³—10 000. 3 000 mg/m³

Phosgene (CG)—20 000 mg/m³—80 % rh—8.0 mg/m³—9.4 min—0.40/8.1 mg/m³—8.1 mg/m³

Phosphine (PH)—2086 mg/m³—50 % rh—0.42 mg/m³—12 min—0.42/278 mg/m³—278 mg/m³

Sarin (GB)—4000 mg/m³—50 % rh—0.04 mg/m³—83 min—0.0001/>0.2 mg/m³—0.1 mg/m³

Sulfur dioxide (SO₂)—1310 mg/m³—50 % rh—13.1 mg/m³—12 min—5.2/262 mg/m³—262 mg/m³

α-Chloroacetophenone (CN)—101 mg/m³—50 % rh—0.32 mg/m³—480 min—0.32/101 mg/m³—101 mg/m³

#155, March 2002 Test Criteria for the 3M™ Cartridge FR-57 Against Various Military and Industrial Chemical Agents

3M's FR-57 cartridge has been tested against military and NIOSH protocol and found to be effective against a number of different chemical warfare agents and industrial chemicals

The FR-57 cartridge contains a high efficiency filter to remove solid and liquid aerosols. It also contains activated and impregnated carbon to absorb or react with gases and liquid vapors.

Ammonia (NH₃)—697 mg/m³—50 % rh—34.8 mg/m³—25 min—17.4/348 mg/m³—348 mg/m³

Carbon tetrachloride (OV)—6290 mg/m³—50 % rh—31.5 mg/m³—25 min—31.5/1888 mg/m³—1888 mg/m³

Chlorine (Cl₂)—1450 mg/m³—50 % rh—14.5 mg/m³—17.5 min—1.5/87.0 mg/m³—87 mg/m³

Chlorine dioxide (ClO₂)—1380 mg/m³—50 rh—0.28 mg/m³—30 min—0.28/27.6 mg/m³—27.6 mg/m³

Chloropicrin (PS)—5000 mg/m³—80 % rh—5.0 mg/m³—27 min—0.67/26.9 mg/m³—26.9 mg/m³

Cyanogen chloride (CK)—2000 mg/m³—80 % rh—2.5 mg/m³—25 min—0.75C/ND (118) mg/m³—118 mg/m³

DMMP—3000 mg/m³—Dry—0.04 mg/m³—59 min—NA—NA mg/m³

Formaldehyde (CH₂O)—123 mg/m³—50 % rh—1.2 mg/m³—50 min—0.37C/36.9 mg/m³—36.9 mg/m³

Hydrogen chloride (HCl)—746 mg/m³—50 % rh—7.5 mg/m³—25 min—7.5C/149 mg/m³—149 mg/m³

Hydrogen cyanide (AC)—2000 mg/m³—80 % rh—1.011 mg/m³—25 min—5.2C/55.3 mg/m³—55.3 mg/m³

Hydrogen fluoride (HF)—57.3 mg/m³—50 % rh—2.5 mg/m³—30 min—2.5C/24.6 mg/m³—24.6 mg/m³

Methylamine (CH₃NH₂)—1270 mg/m³—50 % rh—12.7 mg/m³—25 min—6.4/127 mg/m³—127 mg/m³
Phosgene (CG)—20 000 mg/m³—80 % rh—8.0 mg/m³—9.4 min—0.40/8.1 mg/m³—8.1 mg/m³
Sarin (GB)—4000 mg/m³—50 % rh—0.04 mg/m³—83 min—0.0001/>0.2 mg/m³—0.1 mg/m³
Sulfur dioxide (SO₂)—1310 mg/m³—50 % rh—13.1 mg/m³—15 min—5.2/262 mg/m³—262 mg/m³
Particulates (high efficiency)—100 mg/m³—NA rh—<0.03 % mg/m³—NA min—10 I/ND 3 R/ND mg/m³—10 000 mg/m³,
3000 mg/m³

Protection factor: LRPL testing not performed at the U.S. Army's Protection Factor Test Facility

DESIGN/CONFIGURATION

Visor: Tight fitting—like conventional mask. Single lens. Visor contains coatings to enhance scratch resistance, reduce fogging, or perform other functions. Spectacle kit is available. Visor is rigid. Eye test meets performance criterion.

Field of View: Not specified

Faceblank Material: Silicone

Facepiece Compatibility: Facepiece is NIOSH certified for use with 6000 series APR and SCBAG SCBA, Airmate SCBA

Blower Information:

- **Blower Mount:** Assembly location on the back. Mounting options include the belt and vest. Battery requires a separate mount. Noise generation of blower is <75 db.
- **Blower Weight:** Blower assembly (less battery)—0.816 kg (1.8 lb); battery—0.816 kg (1.8 lb)
- **Blower Interface:** Center/chin interface

Battery Life/Type: >8 h of continual use. Manufacturer specific (rechargeable)—rechargeable NiCad and lithium oxide disposable. There is an option for disposable or rechargeable batteries. Rechargeable batteries are available for training and disposable batteries are available for response operations.

Canister Configuration: Three canisters can be mounted to the blower. Canisters mount to the blower by 40 mm DIN. Canister change by screw in/screw out.

Interoperability with Equipment: Head lamps and active communication equipment

Indicator Alarms: Alarms not available

HUMAN FACTORS

Communication: Equipment does not have a voice amplifier. Speech intelligibility testing has not been performed using NIOSH's test method.

Hydration: Not equipped with hydration capability

Sizes Available: Small, medium, and large

Don/DoFF Information: Assistance not needed for donning/doffing. Average time is >60 s.

Comfort/Weight: Weight of average configuration is 3636 g (8 lb). Turbo unit without filter/cartridge/canister approximately 830 g (1.8 lb). Battery pack (NiMH) approximately 830 g (1.8 lb). Battery pack lithium) approximately 450 g (1.0 lb).

Training: <8 h provided by manufacturer. Respirator requires fit-testing. Respiratory equipment is not certified in the NFPA training procedure.

http://solutions.3m.com/wps/portal/!ut/p/kcxml/04_Sj9SPykssy0xPLMnMz0Q9KzYsPDdaP0I8yizeIINzIN1S_IcFQEALyzu94!

Manuals: Manual instructions are included with the PAPR canister

LOGISTICS

Maintenance Required: After each use

Maintenance Cost: Minimal maintenance cost. Canister replacement is considered a consumable item.

Use/Reuse: Equipment can be cleaned and reused with minimal effort. Procedures are not available to decontaminate and/or dispose of used equipment. recertification NOT required by manufacturer.

Shelf Life: 6 yr to 10 yr; requires nothing more than normal storage conditions

Storage Conditions: 13 °C to 24 °C (55 °F to 75 °F); ≤85 % rh

Package Shape/Volume: ≤0.057 m³ (2.0 ft³); cylindrical soft sided duffle bag (with or without straps)

Color: Not color coded

Health Hazards and Safety: Contains latex

MSDS: MSDS is available

Warranty: In the event any 3M OH&ESD product is found to be defective in material, workmanship, or not in conformation with any express warranty for a specific purpose, 3M's only obligation, and your exclusive remedy, shall be at 3M's option, to

repair, replace, or refund the purchase price of such parts or products upon timely notification thereof and substantiation that the product has been stored, maintained, and used in accordance with 3M's written instructions.

Exclusions to warranty: This warranty is exclusive and is in lieu of any implied warranty of merchantability, fitness for a particular purpose or other warranty of quality, except of title and against patent infringement. Limitation of liability: Except as provided above, 3M shall not be liable or responsible for any loss or damage, whether direct, indirect, incidental, special or consequential, arising out of sale, use or misuse of 3M OH&ESD products, or the user's inability to use such products. The remedies set forth herein are exclusive.

GENERAL

Bullard PA40 Spectrum for First Responder and First Receiver**Model:** PA40SPEC4; PA4SPECDB

Bullard
1898 Safety Way
Cynthiana, Kentucky 41031
POC: Tracy Williams
800-227-0423 (Tel)
859-234-8987 (Fax)
tracy_williams@bullard.com

Source of Information: <http://www.bullard.com>**Availability:** Manufactured on demand—lead time 4 d; minimum order 10 units. Longer lead times for large orders.**NIOSH Status:** TC-21C-0774 (basic 42 CFR 84 approval)—PA4BU with HE NIOSH; TC-23C-2236 (basic 42 CFR 84 approval)—PA3BU with PA3NBC NIOSH

Unit Cost (MSRP): \$1.2K—First Responder (PA4SPECDB) package list price
\$1387—First Receiver, hospital worker (PA30BU3DB) package list price

Component Costs: First Responder (PA4SPECDB)

Blower unit (PA4BU)—\$489
Facepiece assembly (PASPECML)—\$236
Breathing tube (PA4BT)—\$38
Lithium battery pack, disposable (PA3LBP)—\$192
NiMH battery pack, rechargeable (PA3BP)—\$165
Canister/cartridge (PA3NBC)—\$201 per 6
Breathing tube cover (20BTLBTC)—\$12
Airflow indicator (PA1AFI)—\$13
Vinyl decon belt with pad (PA1DB)—\$61
First Receiver, hospital worker (PA30BU3DB)
Blower unit (PA3BU)—\$371
Butyl rubber CC20 Hood (20BUTYL)—\$217
Breathing Tube (PA1BT)—\$25
Lithium battery pack (PA3LBP)—\$192
Canister/cartridge (PA3NBC)—\$201 per 6
Breathing tube cover (20BTLBTC)—\$12
Ratchet suspension (20RT)—\$12
Air flow indicator (PA1AFI)—\$13
Vinyl decon belt with pad (PA1DB)—\$61

Other Certifications: Product discussed in this survey is based upon current Bullard products being modified for future NIOSH CBRN standards

Lens: ANSIZ87.1

Cartridges: C2A1 Canister Military Spec for DMMP, GB, CK, PS, AC, CS, and CN

Independent Testing: Tyvek hood permeation: see DuPont's 2003 permeation guide

ICS—NIOSH presubmittal testing (various tests and dates)

AGE—NIOSH pre-submittal testing (various tests and dates)

Configuration: First Responder (PA4SPECDB)

Components—Manufacturer—Part Number

Blower unit with Decon Belt—Bullard—PA4DB

Facepiece Assembly—Bullard—PASPECML

Breathing Tube—Bullard—PA4BT

Lithium Battery Pack (disposable)—Bullard—PA3LBP

NiMH Battery Pack (rechargeable)—Bullard—PA3BP

Canister/cartridge—Bullard—PA3NBC

Breathing tube cover—Bullard—20BTLBTC

Air flow indicator—Bullard—PA1AFI

First Receiver—hospital worker (PA30BU3DB)

Components—Manufacturer—Part Number
Blower unit—Bullard—PA3BU
Butyl rubber CC20 Hood—Bullard—20BUTYL
Breathing Tube—Bullard—PA1BT
Lithium Battery Pack—Bullard—PA3LBP
Canister/cartridge—Bullard—PA3NBC
Breathing tube cover—Bullard—20BTLBTC
Ratchet suspension—Bullard—20RT
Air flow indicator—Bullard—PA1AFI
Vinyl decon belt w/ pad—Bullard—PA1DB

PAPR Description: First responder: PA40SPEC4—tight-fitting full facepiece assembly, vinyl decon belt, two battery packs for a total 8 h to 10 h capacity, breathing tube, and large speaking diaphragm
First receiver (hospital worker): PA30BU3DB—loose butyl rubber hood, vinyl decon belt, two battery packs for a total of 8 h to 10 h capacity, and breathing tube

PAPR Application: Radiation, biological, or for airborne contaminants other than IDLH (dust, etc.). Products come with warnings not to use in atmospheres with less than 19.5 % oxygen concentration.

EOD Capability: EOD compatibility has not been determined

References: Children's Hospital (Boston)—50 units in use—2 yr—JoAnn Grandchamp (617-355-8040)
Boston Medical

Center—30 units in use—2 yr—Maureen McMahon (617-638-6317)

Hartford Hospital—50 units in use—1.5 yr—Mike Tortora (860-545-1387)

Fluor Hanford D.O.E.—75 units in use—<1 yr—Clif Ledford (509-373-5214)

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: All forms of CAs, BAs, TICs/TIMs, and radiological particulates

Breathing Performance:

- **Inhalation Resistance:** Moderate work rate (conventional). Rated flow output from the blower is 7 ft³/min. Uses 3 canisters with a combined resistance of <65 mm. No official data at this time on measured value of airflow resistance. Canister has 1 HEPA filter and 1 section for vapor gas.
- **Exhalation Resistance:** Equal to or less than 20 mm H₂O. No official data at this time on measured value of airflow resistance.

Environmental Conditions: Common environmental conditions found in the field. Battery has not been cold weather tested.

Environmental Testing: Environmental testing has not been done

Canisters:

- **Canister Information:** Mask uses 2 canisters for HEPA only and 3 canisters for PA3NBC
- **Canister Capacity Rating:** Not specified
- **Canister Service Life:** No official data at this time

Chemical Specific Canisters: Cyanogen chloride—PA3NBC—4000 mg/m³—8.0 mg/m³—32 L/min—30 min

DMMP—PA3NBC—3000 mg/m³—0.04 mg/m³—50 L/min—>120 min

Hydrogen cyanide—PA3NBC—5500 mg/m³—5.0 mg/m³—30 L/min—>30 min

Sarin (GB)—PANBC—4000 mg/m³—0.04 mg/m³—32 L/min—>120 min

Chloropicrin (PS)—PA3NBC—15000 mg/m³—0.7 mg/m³—30 L/min—60 min

Tear gas (CS)—PA3NBC—23 mg/m³—0.4 mg/m³—64 L/min—>480 min

Tear gas (CN)—PA3NBC—101 mg/m³—0.3 mg/m³—64 L/min—>480 min

Protection factor: LRPL testing has been performed on the mask at the U.S. Army's Protection Factor Test Facility in 2003. 95 % of test subjects exceeded 5000 in loose fitting hood study. Range of LRPLs measured across all subjects: 20 000 to 500 000. No official data on range of LRPLs measured in the unblown configuration.

DESIGN/CONFIGURATION

Visor: PA4SPECDB for first responders—Tight fitting, rigid visor, and polycarbonate. Eye test meets visual acuity performance criterion (meets ANSI Z87.1). Single lens, visor contains coatings to enhance scratch resistance, and available spectacle kit.

Field of View: PA40SPEC 95 %; RT hood 90 %; CC20 hood 80 %. No official data at this time on VFS score. Overlapping field-of-view is 100 %.

Faceblank Material: Not specified

Facepiece Compatibility: Facepiece is NIOSH certified for use with APR and SCBA (Spectrum). PAPR facepiece can be used with SCBA.

Blower Information:

- **Blower Mount:** Assembly location on back. One mounting option. Battery integrated into the blower. Noise generation of blower <75 db.
- **Blower Weight:** Blower assembly (less battery)—0.59 kg (1.3 lb). Battery—0.363 kg (0.8 lb) for NiMH and 0.181 kg (0.4 lb) for lithium.
- **Blower Interface:** PA40SPECDB has center/chin interface; PA30BUDB has rear interface

Battery Life/Type: 8 h to 10 h use with 2 batteries. Gang charger can charge 5 packs in 4 h. Both lithium disposable and NiMH rechargeable are offered.

Canister Configuration: Three canisters can be mounted to the blower. Canister change by screw in/screw out.

Interoperability with Equipment: Under development

Indicator Alarms: Advanced warning (audible alarm) provided by battery life indicator. Alarm will sound at least 5 min in advance of air flow falling below 60 CFM. Location of the signal is on housing and breathing tube.

HUMAN FACTORS

Communication: Equipment has a voice amplifier, not CBRN approved. There is a speaking diaphragm. No test methods have been used to assess speech intelligibility.

Hydration: Not equipped with hydration capability

Sizes Available: Small, medium, and large

Don/Doff Information: Assistance not needed for donning/doffing. Average time is 31 s to 60 s.

Comfort/Weight: PA40SPECDB—3.54 kg (7.8 lb); PA30BU3DB—3.04 kg (6.7 lb)

Training: <8 h provided by manufacturer. User manual or onsite training from sales rep. Organization has a written respiratory protection program. PA40SPECDB requires fit-testing. PA30BU3DB does not require fit-testing. Respiratory equipment is not certified in the NFPA training procedure.

Manuals: Cartridge selection guide offered

LOGISTICS

Maintenance Required: Before and after each use

Maintenance Cost: Depends on environment, usage rate, and labor rates

Use/Reuse: Equipment can be cleaned and reused. Disposal procedures are available.

Shelf Life: Not specified

Storage Conditions: Not specified

Package Shape/Volume: $\leq 0.085 \text{ m}^3$ (3.0 ft³). Rigid (cardboard).

Color: Not color coded

Health Hazards and Safety: No known health hazards

MSDS: MSDS is available

Warranty: 1 yr on all components except for hood

GENERAL

Global Secure FR2 First Responder PAPR

Model: FR2

Global Secure Safety
401 S. Main St
Woodsboro, Maryland 21798
POC: Rebecca Vaughan and
Deborah Cummings
202-333-8400 (Tel)
301-845-2777 (Tel)
301-845-2213 (Fax)
rvaughan@globalsecurecorp.com

Source of Information: <http://www.globalsecurecorp.com>
Responder Knowledge Database

Availability: In stock



NIOSH Status: TC-23C-2091 (basic 42 CFR 84 approval)

Unit Cost (MSRP): \$495

Component Costs: Varies, depending on configuration

Other Certifications: Not specified

Independent Testing: Independently tested against war gases and NIOSH approved for a range of industrial gases and HEPA particulate protection

Configuration: Tight-fitting, full facepiece, PAPR with combination multigas filters

PAPR Description: The F2 complete unit has a Neoprene full face mask, air supply tube, integrated blower, alkaline (optional lithium) battery pack, waist belt and two (2) "Super NBC" Filter Canisters. The "Super NBC" Canisters are effective against certain levels of "war gasses" and potential terrorist agents such as nerve and tear gas. It has NIOSH approved protection for P100 HEPA particulates, radon daughters, radio nuclides, organic vapors, chlorine, hydrogen chloride, sulfur dioxide, formaldehyde, ammonia and methylamine. It is a Level "C" respirator and NOT FOR USE in environments that are immediately dangerous to life and health. The NEO-F2 may be kept on stand-by at a convenient location or in a vehicle.

PAPR Application: For use by first responders for accidents or terrorist acts involving nuclear, biological and chemical agents. Designed for law enforcement, emergency medical, fire departments, domestic preparedness, hospital and first responder personnel. Radiation, biological, deep frozen media, and chemical response. Products come with warnings not to use in atmospheres with less than 19.5 % oxygen concentration. Not radiation environments.

EOD Capability: PAPR is not EOD compatible

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: The respirator will protect against vapor, liquid and aerosol forms of CAs. The respirator will protect against particulate, aerosol and liquid forms of BAs. The respirator will protect against radiological particulates.

Breathing Performance:

- **Inhalation Resistance:** Constant flow, moderate breathing rate, moderate work rate (conventional), and high work rate. Rated flow output from the blower is 180 L/min average. Measured value of airflow resistance is less than or equal to 65 mm water column when tested at 85 L/min.
- **Exhalation Resistance:** Equal to or less than 20 mm H₂O

Environmental Conditions: Common environmental conditions found in the field. Battery has not been cold weather tested.

Environmental Testing: Battery has been cold weather tested and subjected to hot diurnal, cold constant, humidity, vibration, and drop testing

Canisters:

- **Canister Information:** Mask is capable of using 2 canisters. Uses the NP5505 din-thread canisters; equipped with a P100 particulate filter. Has standard 40 mm threads.
- **Canister Capacity Rating:** Capacity #1. System does not offer additional performance for one or more of the TRAs.
- **Canister Service Life:** Must be used immediately. Additional testing is scheduled. Manufacturer does not provide any tools for estimating canister service life and the effects of temperature/relative humidity on canister performance.

Chemical Specific Canisters: Ammonia—NP 5010—2500 ppm—80 %—12.5 ppm—64 L/min—>15 min
Cyanogen chloride—NP 5010—300 ppm—80 %—2 ppm—64 L/min—>15 min
Cyclohexane—NP 5010—2600 ppm—80 %—10 ppm—64 L/min—>15 min
Formaldehyde—NP 5010—500 ppm—80 %—1 ppm—64 L/min—>15 min
Hydrogen cyanide—NP 5010—940 ppm—80 %—4.7 ppm
Nitrogen dioxide—NP 5010—200 ppm—80 %—1 ppm—64 L/min—>15 min
Phosgene—NP 5010—250 ppm—80 %—1.25 ppm—64 L/min—>15 min
Phosphine—NP 5010—300 ppm—80 %—0.3 ppm—64 L/min—>15 min
Sulfur dioxide—NP 5010—1500 ppm—80 %—5 ppm—64 L/min—>15 min

Protection factor: LRPL testing not performed at the U.S. Army's Protection Factor Test Facility

DESIGN/CONFIGURATION

Visor: Tight fitting—like conventional mask. Single lens. Visor contains coatings to enhance scratch resistance, reduce fogging, or perform other functions. Spectacle kit is available. Visor is rigid polycarbonate. Eye test meets visual acuity performance criterion.

Field of View: 90 % to 100 % of unmasked FOV (untested). Overlapping field-of-view to the unmasked is untested.

Faceblank Material: Polycarbonate

Facepiece Compatibility: Facepiece is not NIOSH certified for use with APR and SCBA. Certification as PAPR—APR—SCBA is planned. PAPR facepiece can be used with APR and SCBA. Certification is planned.

Blower Information:

- **Blower Mount:** Assembly location on waist (side). Two or more mounting options. Battery integrated into the blower. Noise generation of blower <75 db.
- **Blower Weight:** Blower assembly (less battery)—0.318 kg (0.7 lb). Battery—0.77 kg (1.7 lb) for alkaline; 0.5 kg (1.1 lb) for lithium.
- **Blower Interface:** Right/left cheek (interchangeable)

Battery Life/Type: >8 h of continual use. Manufacturer-specific disposable. There is an option for disposable or rechargeable batteries. Rechargeable batteries are available for training and disposable batteries are available for response operations. There is no battery life indicator.

Canister Configuration: Two canisters can be mounted to the blower. Canisters mount to the blower by DIN 40 connector. Canister change out is very easy.

Interoperability with Equipment: Head lamps and active communication equipment

Indicator Alarms: Advanced warning (audible alarm) provided by battery life indicator. Location of the signal is on battery. Performance of the indicators designed to -30 °C (-22 °F) not yet tested. Audible low flow alarm. Location of the signal is on blower.

HUMAN FACTORS

Communication: Equipment has a voice amplifier, not CBRN approved. Speech intelligibility testing has been performed using NIOSH's test method. Overall performance rating: 91.4.

Hydration: No hydration capability

Sizes Available: Small, medium, and large

Don/Doff Information: Assistance not needed for donning/doffing. Average time is 0 s to 30 s.

Comfort/Weight: Total weight: 3180 g (7 lb)

Super NBC replacement canisters: 910 g (2 lb)

Training: Training not required. <8 h offered by manufacturer—CD and written instructions. Organization has a written respiratory protection program. Respirator requires fit-testing. Respiratory equipment is not certified in the NFPA training procedure.

Manuals: Manual and CDs

LOGISTICS

Maintenance Required: After each use and at least annually

Maintenance Cost: \$100 estimated annual cost

Use/Reuse: Equipment can be cleaned and reused. Recertification NOT required by manufacturer.

Shelf Life: 6 yr to 10 yr; requires nothing more than normal storage conditions

Storage Conditions: -40 °C to 71 °C (-40 °F to 160 °F); 50 % rh

Package Shape/Volume: $\leq 0.028 \text{ m}^3$ (1.0 ft³). Oblong soft sided duffle bag or rigid (cardboard).

Color: Black only

Health Hazards and Safety: No known health hazards

MSDS: MSDS is available

Warranty: Available upon request

GENERAL

MSA OptimAir® 6A PAPR**Model:** OptimAir® 6A

Mine Safety Appliances Company
 PO Box 428
 Pittsburgh, Pennsylvania 15230-0428
 POC: Evan Erickson
 724-733-9274 (Tel)
 724-733-8573 (Fax)
 evan.erickson@msanet.com

Source of Information: <http://www.msanet.com>**Availability:** In stock**NIOSH Status:** Numerous basic 42 CFR 84 approvals with different facepieces**Unit Cost (MSRP):** Varies**Component Costs:** Varies, depending on configuration**Other Certifications:** Basic 42 CFR 84 approval with a wide range of filters**Independent Testing:** Not specified**Configuration:** Various, depending on configuration. Used with Millennium CBRN Gas Mask.

PAPR Description: MSA OptimAir 6A PAPR, complete with Millennium Facepiece, lithium battery, belt, motor/blower module. The MSA OptimAir 6A PAPR filters contaminants from ambient air via CBA/RCA OptiFilter® Cartridges. A belt-mounted motor/blower provides constant air flow via breathing tube to facepiece. It can be used with combination cartridges for protection against particulates, toxic gases and vapors, or a combination of these hazards.

PAPR Application: Radiation and biological. Can be used in atmospheres with less than 19.5 % oxygen.**EOD Capability:** PAPR is EOD compatible**References:** Many used over the last 25 yr

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: All forms of CAs, BAs, TICs/TIMs, and radiological particulates**Breathing Performance:**

- **Inhalation Resistance:** Constant flow, high breathing rate (will provide 6 cfm); constant flow, moderate breathing rate; and moderate work rate (conventional). Exceeds NIOSH requirements. Measured value of airflow resistance is less than or equal to 65 mm water column when tested at 85 L/m. Canister has two filters.
- **Exhalation Resistance:** Equal to or less than 20 mm H₂O

Environmental Conditions: Common environmental conditions found in the field**Environmental Testing:** Battery has been cold weather tested and subjected to hot diurnal, cold constant, humidity, vibration, and drop testing**Canisters:**

- **Canister Information:** Mask is capable of using 2 canisters. Equipped with a P100 particulate filter. Has standard 40 mm threads.
- **Canister Capacity Rating:** Refer to NIOSH requirements
- **Canister Service Life:** Manufacturer does not provide tools for estimating canister service life and the effects of temperature/relative humidity on canister performance

Chemical Specific Canisters: Refer all to NIOSH**Protection factor:** LRPL testing performed on the mask at the U.S. Army's Protection Factor Test Facility. 95 % of test subjects exceeded 5000.

DESIGN/CONFIGURATION

Visor: Tight fitting—like conventional mask. Single lens. Visor contains coatings to enhance scratch resistance, reduce fogging, or perform other functions. Spectacle kit is available. Visor is rigid (UltraElite and Ultravue) or flexible (Millennium). Eye test meets visual acuity performance criterion.

Field of View: 90 % to 100 % of unmasked FOV for Millennium and Ultra Elite; 80 % to 89 % of unmasked FOV for Ultravue

Faceblank Material: Natural/nitrile blend

Facepiece Compatibility: Facepiece is NIOSH certified for use with APR. Same mask can be used for multiple platforms. To accommodate the wide range of users and respiratory protection needs, OptimAir 6A PAPRs are available with tight-fitting mask or Tyvek hood.

Blower Information:

- **Blower Mount:** Assembly location on side. There is one or more mounting options. Battery integrated into the blower. Refer to NIOSH requirements for noise generation of blower.
- **Blower Weight:** Blower assembly (less battery)—0.91 kg (2 lb); battery—1.81 kg (4 lb) for NiCad, 0.45 kg (1 lb) for lithium
- **Blower Interface:** Right/left cheek (interchangeable)—Millennium; Center/chin interface—Ultra Elite and Ultravue

Battery Life/Type: >8 h of continual use. Maintenance-free lithium battery with 10 yr shelf life. Optional rechargeable NiCd battery; optional battery and charger; standard single-unit battery charger; and single-unit, dual-rate battery charger.

Canister Configuration: Two canisters can be mounted to the blower. Canisters mount to the blower by 40 mm (NATO) thread. Tools not required for changing canister.

Interoperability with Equipment: Head lamps—not supplied by MSA, and active communication equipment

Indicator Alarms: No advanced warning (alarm) provided by battery life indicator

HUMAN FACTORS

Communication: Equipment has a voice amplifier, CBRN approved for use. Speech intelligibility testing has been performed using NIOSH's test method.

Hydration: MSA Millennium has hydration capability; MSA Ultra Elite and Ultravue do not have hydration capability. U.S. DOD canteen with M1 or Camelbak connector is compatible with the standard M1 canteen cap.

Sizes Available: Small, medium, and large

Don/DoFF Information: Assistance not needed for donning/doffing. Average time is 31 s to 60 s.

Comfort/Weight: Varies, depending on configuration. Maximum is 2.72 kg (6 lb).

Training: <8 h provided by manufacturer—video tapes. Organization has a written respiratory protection program. Respirator requires fit-testing. Respiratory equipment is not certified in the NFPA training procedure.

Manuals: Manual

LOGISTICS

Maintenance Required: Before and after each use

Maintenance Cost: Not specified

Use/Reuse: Equipment can be cleaned and reused with minimal effort. Disposal procedures are not available.

Shelf Life: >=10 yr; requires nothing more than normal storage conditions. Lithium battery—8 yr.

Storage Conditions: Not specified

Package Shape/Volume: $\leq 0.057 \text{ m}^3$ (2.0 ft³). Soft sided duffel bag (with or without straps) or rigid (cardboard, metal, or plastic).

Color: Not color coded

Health Hazards and Safety: No known health hazards

MSDS: MSDS is available

Warranty: Commercial warranty

GENERAL

The SEA Group SE 400 and SE 46**Model:** SE 400 (2 filters) and SE 46 (3 filters)

Safety Equipment of America (The SEA Group)
 11 Business Park Drive
 Branford, Connecticut 06405
 POC: Bengt Kjellberg
 888-732-3500 (Tel)
 203-483-9483 (Tel)
 203-483-9483 (Fax)
 bengtk@sea.com.au

Source of Information: <http://www.isea.com.au>**Availability:** In stock. Currently <4 wk for order <1000 units (Type SE 400).**NIOSH Status:** SE 46 submitted for NIOSH industrial approval (42CFR Part 84). Expect to send the same PAPR unit in for CBRN approval when the standard is ready.**Unit Cost (MSRP):** ~ \$2.6K

Component Costs: Fan unit estimated cost—\$2K
 Mask—\$280
 Harness—\$120
 Bag—\$60
 Filters—each \$50 (estimated cost)

Other Certifications: SE 46 has been submitted for NIOSH industrial approval**Independent Testing:** NIOSH bench mark testing. See our website at www.sea.com.au. January 2005.**Configuration:** Components—Manufacturer—Part Number

SE 46 fan unit—SEA—TBA

Full face mask HB—SEA—50140

Back pack harness—SEA—50137

Domestic preparedness filter—SEA—TBA

HE-T Particle filter, threaded—SEA—50089

Prefilter—SEA—27

PAPR Description: The SE 46 is a breath responsive PAPR with an approximate airflow of 460 L (peak air flow) meeting the high air flow requirements for first responders in NIOSH proposed concept paper. Audible as well as a light in front of the mask will warn the user approximately 25 min before the unit no longer can provide 460 L peak flow of air to the user. This allows the user time to escape from the area in a safe manner. The SE 46 is also equipped with the same type of warning system for negative pressure in the mask with a different color code. The unit will test itself every second and warn the user if any of the calibrated parts are outside its calibrated settings or if anything unusual is happening with the unit. It will also warn for clogged filters and can be calibrated to warn the user when to change filters, based on volume of air through the filter or how long the filter has been used or whatever comes first, time or volume. The SE 46 has a data logging function logging up to 500 events. These events can be downloaded, or the unit can be used as a “black box” only to automatically make a registration of the last 500 events. The unit is designed to give a protection factor of approximately 3000 in power off mode (test conducted on U.S. army personnel). SE 46 can be equipped with a pressurization hose providing positive pressure in a Level A or Level B suit. The skin protection factor in the Level B suit is approximately 500. See U.S. army test:

(http://www.ecbc.army.mil/downloads/reports/se_shield_suit_se400_papr.pdf). The domestic preparedness filter can be equipped with a prefilter that filters out dirt and dust (particles bigger than 3 μ). The prefilter can be changed without removing the main filter and was changed out approximately every hour during the WTC event.

PAPR Application: Radiation and biological. The SE 46 is designed to be used for rescue and recovery as well as lifting and carrying people as per specification in NIOSH concept paper at

<http://www.cdc.gov/niosh/npptl/standardsdev/cbrn/papr/concepts/paprcon-040104.html> (high and heavy work rate).

Manufacturer provides specific guidance and warnings to users related to the use of the respiratory equipment in atmospheres with less than 19.5 % oxygen concentration. All limitations will be specified in the user’s manual as well as in our training program.

EOD Capability: Not designed to be used with a protective bomb suit**References:** New York State EMA—1600 units in use—2 yr—John Gibbs (518-485-9169)

California National Guard—85+80+90 units in use—1 yr—Capt Steve Poteat (562-762-5708)
Massachusetts Emergency Management—50 units in use—1 yr—David Ladd (978-567-3117)
FEMA, Special Operation Response Team (SORT) North Carolina—37 units in use—3 yr—Richard Moore (336-759-3924)
Emergency Management Australia—1500 units in use—2 yr

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: All forms of CAs, BAs, TICs/TIMs, and radiological particulates

Breathing Performance:

- **Inhalation Resistance:** Demand responsive, high breathing rate. Rated flow output from the blower estimated 360 L peak flow with CBRN filters. Measured value of airflow resistance is less than or equal to 55 mm water column when tested at 85 L/m. Measured value of airflow resistance is less the 55 mm H₂O. Canister has three filters. Inhalation resistance in the unblown configuration is 23.5 mm H₂O.
- **Exhalation Resistance:** Equal to or less than 20 mm H₂O. The latest CBRN proposed standard does not have direct requirements for the breathing resistance. They are specifying the pressure inside the mask should be within 0 in to 3.5 in H₂O (ref. to NIOSH PAPR CBRN draft 30 March 2005 par. 4.4.4).

Environmental Conditions: Common environmental conditions found in the field

Environmental Testing: Battery has been cold weather tested and subjected to hot diurnal, cold constant, humidity, vibration, and drop testing. NIOSH has made bench mark testing and we had good result in all tests, including temperature testing. The unit works very well in extreme low temperature under the condition that the battery is charged and stored as per manufactures recommendations.

Canisters:

- **Canister Information:** SE 46 has 3 canisters/cartridges; SE 400 has 2 canisters/cartridges. Equipped with a P100 particulate filter. Has standard 40 mm threads.
- **Canister Capacity Rating:** Cap 3
- **Canister Service Life:** Greater than 30 d; 6 mo with attached cap and lid on filter but removed from the aluminum foil. SEA has developed SE Data program, the most advanced tool for calculating estimated canister life not just based on temperature/humidity and contamination level, but the SAE 46 and SE 400 can record each individual breathing rate and the PAPR unit can be programmed in such a way that the user gets an audible and visual alarm when it is time to change filter.

Chemical Specific Canisters: Ammonia (NH₃)—5000 ppm—30 L/min—50 min

Chlorine (Cl₂)—5000 ppm—30 L/min—40 min

Cyanogen chloride—500 ppm—64 L/min—>35 min

Cyclohexane—5000 ppm—30 L/min—50 min

Formaldehyde—100 ppm—64 L/min—>100 min

Hydrogen cyanide—5000 v—30 L/min—72 min

Hydrogen sulfide—5000 ppm—30 L/min—>120 min

Sulfur dioxide—5000 ppm—30 L/min—23 min

Carbon tetrachloride (CCl₄)—1000 ppm—64 L/min—>65 min

Methylamine (CH₃NH₂)—1000 ppm—64 L/min—>80 min

ClO₂—500 ppm—64 L/min—>60 min

Hydrogen fluoride (HF)—70 ppm—64 L/min—>60 min

O-chloro-benzylidene malonotrile (CS)—3 ppm—64 L/min—>480 min

CN tear gas—16 ppm—64 L/min—>480

DOP—200 mg—85 L/min—40 mm H₂O (penetration 0.004 %)

Sarin (GB) nerve agent lethal dose is 35 mg/m³; effective dose is 25 mg/m³—300mg/m³—25 L/min—>60 min

Cyanogen chloride (CK)—4000 mg/m³—50 L/min—>45 min

Chloroacetophenone (CN)—16 ppm—64 L/min—>480 min

Protection factor: LRPL testing has been performed on the mask at the U.S. Army's Protection Factor Test Facility. The SE 400 was tested and 100 % of the test subjects passed the 2000 to 4999 FP range. 95 % of test subjects exceeded 5000. SE 400 in unblown configuration received, when tested by U.S. Army personnel, an approximately fit factor of 3000. 100 % passed LRPL of 500 to 999.

DESIGN/CONFIGURATION

Visor: Tight fitting—like conventional mask. Single lens. Visor contains coatings to enhance scratch resistance, reduce fogging, or perform other functions. Spectacle kit is available. Visor is rigid hard coated polycarbonate. Eye test meets visual acuity performance criterion.

Field of View: 70 % to 79 % of unmasked FOV. Field of view overlap 72.5 %, average effective FOV is 77.5 %. Overlap 72.5 average effective FOV is 77.5 %.

Faceblank Material: Halo-butyl rubber

Facepiece Compatibility: Facepiece is not NIOSH certified for use with APR and SCBA. PAPR facepiece can be used only with PAPR. Separate mask is needed for multiple platforms.

Blower Information:

- **Blower Mount:** Assembly location on back, front, or side. There are two or more mounting options. Single battery configuration is integrated in blower, dual battery configuration batteries mounted on the user's front shoulder strap for even weight distribution between chest and back as well as same weight distribution on each shoulder. Noise generation of blower is <75 db. The SE 46 is a breath responsive unit and the noise level is dependent on air flow.
- **Blower Weight:** Blower assembly (less battery and without mask, battery hose, and filter)—1080 g (2.38 lb); battery—600 g (1.32 lb)
- **Blower Interface:** Center/chin interface

Battery Life/Type: <12 h of continual use. 13 h dual battery configuration at 1.5 L air, 25 breath/min. The SE 400 and SE 460 are breath responsive PAPRs maintaining positive pressure in the mask up to approximately 400 L to 450 L. Batteries are manufacturer specific (rechargeable). Disposable batteries are not available as they do not have the ability to provide enough power for a breath responsive PAPR meeting NIOSH proposed high performance requirements. Each PAPR unit comes with 2 batteries. Included is a fast smart charger, charging time approximately 2 h (operational time approximately 4 h/battery) allowing continued use unlimited of charging time. Separate battery charging/conditioning battery box for 28 batteries also available, automatically charging and conditioning batteries during long term storage.

Canister Configuration: Prefilter with either CBRN canister or P-100 filter for virus/bacterial and particles. Canisters mount to the blower by 40 mm (NATO) thread. Canister change by screw in/screw out.

Interoperability with Equipment: Head lamps and active communication equipment

Indicator Alarms: Advanced warning (visible, audible, or vibratory alarm) provided by battery life indicator. Bench mark tested by NIOSH green light in front of the mask for low battery warning. Warns the user every minute until there are 3 min left when the alarm is on all the time. (Positive pressure in the face mask up to 300 L peak flow during the warning period.) Accidental shut-off protection for battery. Fan cannot be accidentally shut off; will automatically shut off if the user does not breathe in the unit during a time period of 1 min. Combination of visible, audible, or vibratory low flow alarm. The alarm will sound immediately and will repeat warning for negative pressure in the mask. Also warn the user if any function of the unit is outside set parameters, which could cause a malfunction of the unit.

HUMAN FACTORS

Communication: Equipment has a voice amplifier, not CBRN approved. Speech intelligibility testing has been performed using NIOSH's test method.

Hydration: Connector is compatible with the standard M1 canteen cap

Sizes Available: Small and medium

Don/Doff Information: Assistance not needed for donning/doffing. Average time is 31 s to 60 s.

Comfort/Weight: Fan—1.08 kg (2.38 lb); mask, hose, harness, and battery—approximately 2.7 kg (5.95 lb). Total weight—3.78 kg (8.33 lb).

Training: <8 h provided by manufacturer. Written respiratory protection program will be implemented as soon as the SE 46 is NIOSH CBRN approved. Respirator requires fit-testing. Respiratory equipment is not certified in the NFPA training procedure. Extensive power point training program developed together with our military customer.

Manuals: There are no CBRN approved canisters for a CBRN PAPR until the standard is ready, and the product has passed the test and received an approval

LOGISTICS

Maintenance Required: Before and after each use

Maintenance Cost: Based on experience the average maintenance cost <\$10/yr (filter exchange not included). Each PAPR unit comes with 2 batteries. Included is a fast smart charger, charging time approximately 2 h (operational time approximately 4 h/battery) allowing continued use of unlimited charging time. Separate battery charging/conditioning battery box for 28 batteries also available, allowing charging and conditioning batteries during long term storage.

Use/Reuse: Equipment can be cleaned and reused with minimal effort. The SE 46 unit can be placed inside a pressurized SE Shield suit protecting the unit from liquid CAs and does not have to be thrown away after each use as per current concept paper for CBRN PAPR units. Disposal procedures are available.

Shelf Life: 20 yr; requires nothing more than normal storage conditions

Storage Conditions: -20 °C to 55 °C (-4 °F to 131 °F); 70 % rh. Clean and dry area away from excessive heat or cold and direct sunlight.

Package Shape/Volume: $\leq 0.028 \text{ m}^3$ (1.0 ft³). Soft sided duffle bag (with or without straps).

Color: Not color coded

Health Hazards and Safety: No known health hazards

MSDS: MSDS is available

Warranty: The SE 400 and SE 46 is supplied with a comprehensive warranty covering the motor and the main circuit board for 3 yr or 6000 operating h, whichever comes first. Other parts are covered for 12 mo for manufacturing faults (not including wear and tear). Some exclusions apply. One year warranty on components and parts.

GENERAL

SafetyTech International C420 PAPR**Model:** N-60122-001

SafetyTech International, Inc.
 5703 Industry Lane
 Frederick, Maryland 21704
 POC: Jeff Paden
 301-624-5600 (Tel)
 888-744-6462 (Tel)
 301-624-5688 (Fax)
 jpaden@safetytechint.com

Source of Information: <http://www.safetytechint.com>**NIOSH Status:** TC-23C-2188 (basic 42 CFR 84 approval)**Unit Cost (MSRP):** \$1229 without batteries**Component Costs:** Component costs vary**Other Certifications:** NIOSH Approved C420 PAPR Systems: NIOSH Approval TC-23C-2188 HE/OV/AM/CL/HC/MA**Independent Testing:** Not specified**Configuration:** Not specified

PAPR Description: N-60122-001—C420 PAPR is a NIOSH approved National Guard Kit, two battery options, that includes C420 1-speed blower, Promask 2000 gas mask, breathing tube, decon belt, airflow indicator, BA5800/U 10 h mission battery, 1-position battery charger with two NiMH rechargeable batteries, Cap 2-M95 combination filter cartridges, and molded carrying case.

N-60123-001—C420 PAPR is a NIOSH approved National Guard Kit, rechargeable only, that includes C420 1-speed blower, Promask 2000 mask, breathing tube, decon belt, airflow indicator, 1-position battery charger with (2) NiMH rechargeable batteries, Cap 2-M95 combination filter cartridges, and molded carrying case. N-60042-001—C420 PAPR is a NIOSH approved Responder Kit with Promask 2000 includes C420 1-speed blower, Promask 2000, breathing tube assembly, two M95 combination filter cartridges, airflow indicator, decon belt, BA-5800/U battery, and molded carrying case. N-60041-001—C420 PAPR is a NIOSH approved Tactical Kit w/M95 mask that includes C420 1-speed blower, M95 gas mask (regular), breathing tube, two M95 combination filter cartridges, an airflow indicator, decon belt, BA-5800/U battery, and molded carrying case.

During use, ambient air is pulled through the two NIOSH certified filters to supply constant, purified air to the mask. This positive pressure system improves the protection factor by approximately five times over the negative pressure mask and single filter. Batteries can be easily “hot-swapped” in a warm zone and recharged using the kit’s charger.

PAPR Application: Not recommend for flammable environment or submerged in water or any other type of liquid(s). Can be used in IDLH environments or atmosphere with less than 19.5 % oxygen concentration.

EOD Capability: Not specified

References: U.S. National Guard CERFP (Decon & Extraction Teams); FBI SWAT; U.S. Army M48 NBC Apache Aviator Mask Program; U.S. Army Medical; U.S. Navy EOD; U.S. Army EOD; and Howard Co., Maryland SWAT

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: All forms of CAs, BAs, and radiological particulates**Breathing Performance:** Air flow rate: 130 lpm to 140 lpm

- **Inhalation Resistance:** Moderate work rate (conventional). 4 ft³/min of purified air to mask with C420 PAPR.
- **Exhalation Resistance:** Not specified

Environmental Conditions: Not specified**Environmental Testing:** Not specified**Canisters:**

- **Canister Information:** Mask is capable of using 2 canisters
- **Canister Capacity Rating:** Not specified
- **Canister Service Life:** Not specified

Chemical Specific Canisters: Not specified

Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Tight fitting—like conventional mask

Field of View: 85 %

Faceblank Material: Not specified

Facepiece Compatibility: Not specified

Blower Information:

- **Blower Mount:** Assembly location on waist back. NIOSH approved mounted on waist. SPECOPS pouch for vest, EOD leg mount, ITAP mount on side harness.
- **Blower Weight:** Not specified
- **Blower Interface:** Not specified

Battery Life/Type: 8 h to 10 h with M-70005-001 M95 cartridge: NSN 6640-01-500-7117 (case/20: NSN 6640-01-500-7706). Disposable LiSO₂ 8 h mission battery.

Canister Configuration: Canisters mount to the blower by Rd 40 x 1/7 thread per EN 148-1 (40mm) NATO thread

Interoperability with Equipment: Not specified

Indicator Alarms: Not specified

HUMAN FACTORS

Communication: Built-in communications port. Speech diaphragm enables clear communication.

Hydration: Hydration capability

Sizes Available: Small, medium, and large

Don/Doff Information: Assistance not needed for donning/doffing. Average time is 31 s to 60 s.

Comfort/Weight: <2.49 kg (5.5 lb) as worn; 5.44 kg (12 lb) complete with case and entire rechargeable kit.

Training: <8 h provided by the manufacturer

Manuals: Manual

LOGISTICS

Maintenance Required: After each use per user manual

Maintenance Cost: \$5—also, 3 yr factory recertification \$50 (replace all seals and complete performance testing)

Use/Reuse: Equipment can be cleaned and reused. Recertification required by manufacturer. Fully decontaminable.

Shelf Life: 11 yr to 15 yr

Storage Conditions: Not specified

Package Shape/Volume: $\leq 0.057 \text{ m}^3$ (2.0 ft³). In cube shaped case. 56 cm x 23 cm x 23 cm (22 in x 9 in x 9 in) for case (20) M95 cartridges (NSN 6640-01-500-7706).

Color: Not color coded

Health Hazards and Safety: No known health hazards

MSDS: MSDS available for both battery types

Warranty: Individual system components carry varying warranties. Products are warranted against manufacturers defects and workmanship for a minimum of 1 yr.

GENERAL

Scott Proflow 3

Model: 805820

Scott Health & Safety
4320 Goldmine Rd
Monroe, North Carolina 28110
POC: Luanne Freund
704-291-8409 (Tel)
704-291-8420 (Fax)
lfreund@tycoint.com

Source of Information: <http://www.tycoint.com>



NIOSH Status: Meets basic 42 CFR Part 84 for CA penetration and permeation, face piece fit factor testing, and environmental conditioning

Unit Cost (MSRP): Not specified

Component Costs: Component costs vary

Other Certifications: Proflow 3 with “Autoflow Control” is NIOSH approved. Meets 42 CFR Part 84 requirements for CA penetration and permeation, face piece fit factor testing, and environmental conditioning.

Independent Testing: Not specified

Configuration: Approved with Scott SCBA CBRN face pieces—AV 2000 and AV 3000; also approved with M98; M95, and butyl hood

PAPR Description: Exceeds current NIOSH flow rates. It also uses flow management technology to adjust flow when pressure drop varies due to filter loading (particulate), or when filters are changed, such as HEPA for a combination cartridge. Proflow 3 increases speed as the user increases work rate. Meets 42 CFR Part 84 requirements for CA penetration and permeation, face piece fit factor testing, and environmental conditioning. Approved with Scott SCBA CBRN face pieces—AV 2000 and AV 3000; also approved with M98; M95, and butyl hood.

PAPR Application: NIOSH CBRN PAPR Draft standard (final) is expected to be available September 2005. Scott has integrated SCBA/Demand technology that will meet anticipated NIOSH CBRN PAPR First Responder “warm zone” scenarios. Contact Luanne Freund (704-291-8409), Scott Domestic Preparedness Marketing Manager for further information or a meeting to review this technology.

EOD Capability: Not specified

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: Not specified

Breathing Performance:

- **Inhalation Resistance:** Proflow 3 increases speed as the user increases work rate
- **Exhalation Resistance:** Not specified

Environmental Conditions: Not specified

Environmental Testing: Not specified

Canisters:

- **Canister Information:** Not specified
- **Canister Capacity Rating:** Not specified
- **Canister Service Life:** Not specified

Chemical Specific Canisters: Not specified

Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Tight fitting—like conventional mask

Field of View: 87 %

Faceblank Material: Not specified

Facepiece Compatibility: Not specified

Blower Information:

- **Blower Mount:** Not specified
- **Blower Weight:** Not specified
- **Blower Interface:** Not specified

Battery Life/Type: Not specified

Canister Configuration: Not specified

Interoperability with Equipment: Not specified

Indicator Alarms: Not specified

HUMAN FACTORS

Communication: Not specified

Hydration: Not specified

Sizes Available: Small, large, and extra large

Don/DoFF Information: Not specified

Comfort/Weight: Not specified

Training: Not specified

Manuals: Not specified

LOGISTICS

Maintenance Required: Not specified

Maintenance Cost: Not specified

Use/Reuse: Not specified

Shelf Life: Not specified

Storage Conditions: Not specified

Package Shape/Volume: Not specified

Color: Not specified

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: Not specified

GENERAL

First Line Technology TST/SWEDE Butyl PAPR**Model:** TST-BUTYLPAPRKIT

First Line Technology, LLC.
 PO Box 58111
 Washington, District of Columbia 20037
 POC: Amit Kapoor
 202-249-8480 (Tel)
 202-318-8480 (Fax)
 akapoor@firstlinetech.com

Source of Information: <http://www.firstlinetech.com>**Availability:** In stock—30 d, depends on quantity. Can be manufactured on demand.**NIOSH Status:** Submitted for NIOSH industrial approval (42CFR Part 84)**Unit Cost (MSRP):** \$775

Component Costs: Filter 100 (ABEKP-3-Radiak, prEN 146)—\$40 each
 Butyl hood—\$326
 Blower unit—\$375
 Tyvek F hood—\$181

Other Certifications: System has passed all testing by ICS (independent testing organization). CE mark standards: pr EN146 and EN 12941.**Independent Testing:** ICS Lab, Inc. Testing documentation was included: 10/7/2004, 10/11/2004, 10/4/2004, 3/19/2002, and 11/19/2001.**Configuration:** Not specified

PAPR Description: The combination of the highly impermeable butyl rubber material with SWEDE respiratory protection PPE design creates a butyl hood with increased safety levels. Butyl rubber offers an extremely high level of protection against all known chemical agents in solid, liquid, and gaseous forms for extended durations of time. Butyl is easily cleaned with a soap solution allowing for multiple uses and prolonged life of up to 25 yr. The end result is better protection in hazardous environments. The silicon half mask allows for a broader range of end users including those with glasses, facial hair, and long hair. Every butyl hood has a straw and clean water drinking system with quick connections for safe and easy hydration. Seams are stitched and butyl taped to prevent inward leakage. Integrated communications with voice amplifiers and radio sets are optional.

PAPR Application: Radiation, biological, and deep frozen media. Can be used in atmospheres with less than 19.5 % oxygen.**EOD Capability:** PAPR is not EOD compatible

References: Swedish National Board of Health and Welfare—5000 units in use—8 yr—Jonas Holst (0046-8555-53-049)
 Norwegian Civil Defense—1500 units in use—4 yr—Erik Gran (+47-33-41-25-00)
 Danish Civil Defense Force—400 units in use—4 yr—Major Poul B Horup (0045-4590-6000)
 U.S. Housing and Urban Development—4 units in use—1 yr—Michael Zelaska (202-708-0614)

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: All forms of CAs, BAs, TICs/TIMs, and radiological particulates**Breathing Performance:**

- **Inhalation Resistance:** Moderate work rate (conventional) and high work rate. The rated flow output from the blower is 140 L/min.
- **Exhalation Resistance:** Not specified

Environmental Conditions: Battery has not been cold weather tested**Environmental Testing:** Environmental testing has not been done**Canisters:**

- **Canister Information:** Mask is capable of using 2 canisters. Equipped with a P100 particulate filter. Has standard 40 mm threads.

- **Canister Capacity Rating:** Not specified
- **Canister Service Life:** 1 d to 4 d. Manufacturer does not provide any tools for estimating canister service life and the effects of temperature/relative humidity on canister performance.

Chemical Specific Canisters: Not specified

Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Tight fitting—like conventional mask. Hood with tight fitting neck seal. Single lens. Visor contains coatings to reduce fogging. Spectacle kit is available. Visor is rigid. Eye test meets visual acuity performance criterion.

Field of View: Not specified

Faceblank Material: Not specified

Facepiece Compatibility: Facepiece is not NIOSH certified for use with APR and SCBA

Blower Information:

- **Blower Mount:** Assembly location on back or side. There are two or more mounting options. Battery requires a separate mount. Noise generation of blower—right ear 73.8 db; left ear 72.3 db.
- **Blower Weight:** Not specified
- **Blower Interface:** Rear interface

Battery Life/Type: <4 h of continual use. Standard COTs battery. There is an option for disposable or rechargeable batteries. Rechargeable batteries are available for training and disposable batteries are available for response operations.

Canister Configuration: Not specified

Interoperability with Equipment: Head lamps and active communication equipment

Indicator Alarms: Advanced warning (audible alarm) provided by battery life indicator when ~20 min left with airflow over 115 L/min. There is no accidental shut-off protection for battery. Audible low flow alarm with 20 min remaining.

HUMAN FACTORS

Communication: Equipment has a voice amplifier that is CBRN approved for use

Hydration: A canteen is provided with the system

Sizes Available: One size fits all

Don/Dooff Information: Assistance not needed for donning/doffing. Average time is 0 s to 30 s.

Comfort/Weight: Total weight of equipment—1.59 kg (3.5 lb)

Training: <8 h provided by manufacturer. Training is available at an additional cost.

Manuals: Manual

LOGISTICS

Maintenance Required: Semi-annually

Maintenance Cost: \$20 yearly cost of renewing batteries

Use/Reuse: Equipment can be cleaned and reused with minimal effort. Procedures are available to decontaminate and/or dispose of used equipment.

Shelf Life: 20 yr shelf life; requires nothing more than normal storage conditions. 5 yr shelf life for filters (expiration date is stamped on each filter).

Storage Conditions: -30 °C to 40 °C (-22 °F to 104 °F); 50 % rh

Package Shape/Volume: $\leq 0.028 \text{ m}^3$ (1.0 ft³). Soft sided duffle bag (with or without straps).

Color: Minimum order for custom colors: 300 kits of hood and coverall

Health Hazards and Safety: No known health hazards

MSDS: MSDS not available

Warranty: The Manufacturer warrants the equipment and materials sold to end-users will be fit for its intended purpose and will be free from manufacturing defects for a period of 12 mo from the date of sale. This warranty shall not cover damages to any product resulting from (i) failure to follow operating instructions, (ii) negligence or accident, or (iii) repairs, alterations, or installation performed by any person or firm not duly authorized by manufacturer in writing; nor shall this warranty apply to any product from which manufacturer identification number has been removed or defaced.

GENERAL

3M™ Breathe Easy™ 10 Butyl Rubber Hood PAPR System**Model:** FR57L10 or FR57N10

3M
 3M Center
 Building 235-2W-70
 Saint Paul, Minnesota 55144-1000
 POC: Erik Johnson and Geoff Betsinger
 800-243-4630 (Tel) Technical
 800-328-1667 (Tel) Sales
 651-736-7344 (Fax)
 gbbetsinger@mmm.com
 occsafety@mmm.com

Source of Information: <http://www.3m.com>**Availability:** In stock—lead time is weeks**NIOSH Status:** TC-23C-2071 (basic 42 CFR Part 84 approval)**Unit Cost (MSRP):** \$1.25K**Component Costs:** Turbo PAPR—\$330

RRPAS bag vest—\$250

Butyl rubber hood—\$258

Airflow indicator—\$21

Lithium battery—\$250

NiCad battery—\$250

Breathing tube—\$87

FR40—\$21 ea

FR57—\$25 ea

Other Certifications: Product is certified by NIOSH under 42CFR Part 84. Submissions will follow standard finalization.**Independent Testing:** Cartridges tested to U.S. MIL-C-51560(EA), NATO Triptych AC/225 (Panel VII) D/103, QSTAG 1009. The BE-10 Series hood in butyl rubber offers resistance to certain CAs and a range of other chemicals and meets Military Standard MIL-C-51251A (for butyl). Protection factor testing of the 3M Breathe Easy 10 PAPR, SBCCOM, 8 May 2003. Domestic preparedness: Sarin vapor challenge and corn oil Protection Factor (PF) testing of 3M BE10 PAPR, June 2001, SBCCOM.**Configuration:** Submission status is unknown at this point**PAPR Description:** PAPR consisting of butyl rubber hood, breathing tube and clamps, bag/vest, turbo motor blower unit, belt, battery pack options (Lithium and NiCad batteries), airflow indicator, and three combination cartridges/filters.**PAPR Application:** Use of this respirator in atmospheres for which it was not NIOSH certified or designed may result in sickness or death. Do not wear this respirator where atmospheres are oxygen deficient, contaminant concentrations are unknown, contaminant concentrations are IDLH, or where contaminant concentrations exceed the assigned protection factor (APF) recommended for the applicable headpiece or the APF mandated by specific government standards, whichever is lower. Refer to the User Instructions provided with the applicable headpiece.**EOD Capability:** PAPR is not EOD compatible

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: All forms of CAs, BAs, TICs/TIMs, and radiological particulates**Breathing Performance:**

- **Inhalation Resistance:** Moderate work rate (conventional). <65 mm H₂O. 4 ft³ to 15 ft³ per min, depending on respirator inlet cover. Canister has one filter. User instructions recommend that personnel leave the area immediately if blower fails.
- **Exhalation Resistance:** Measured value of airflow resistance: <20 mm H₂O

Environmental Conditions: Service life of the canister against organic vapors will be less in high rh environments**Environmental Testing:** Common environmental conditions found in the field. Cold weather testing is no longer a requirement in current CBRN Draft. However, cold testing will be performed to manufacturer's claims. No additional tests were performed.

Canisters:

- **Canister Information:** Has 3 cartridges. Canisters contain high efficiency filters. N/R/P 95/100 terminology is for negative pressure respirators only. Has 40 mm DIN threads. Canister volume is 915 cc.
- **Canister Capacity Rating:** Product meets 42CFR Part 84 requirements. Refer to data contained in canister information.
- **Canister Service Life:** Cartridges have a 5 yr shelf life when they remain unopened. 3M recommends that the canisters remain unopened until use. Users can determine service life using software developed by 3M. Service life is difficult to determine when concentrations and environmental conditions are not known. The useful service life of chemical cartridges will depend on the rate of airflow through the cartridges, specific type, volatility, and concentration of the contaminants; and environmental conditions such as humidity and temperature. Replace cartridge/filter combination in accordance with an established change schedule or filter time-use restrictions, whichever occurs first. Cartridges should be changed immediately if smell, taste, or irritation from contaminant is detected. Filters must be replaced immediately if they become damaged, soiled or if increased resistance occurs. Provided on website at: www.3m.com/occsafety/html/cartridgechange.html.

Chemical Specific Canisters: #155, March 2002 Test Criteria for the 3M™ Cartridge FR-57 Against Various Military and Industrial Chemical Agents

3M's FR-57 cartridge has been tested against military and NIOSH protocol and found to be effective against a number of different chemical warfare agents and industrial chemicals

The FR-57 cartridge contains a high efficiency filter to remove solid and liquid aerosols. It also contains activated and impregnated carbon to absorb or react with gases and liquid vapors.

Ammonia (NH₃)—697 mg/m³—50 % rh—34.8 mg/m³—25 min—17.4/348 mg/m³—348 mg/m³

Carbon tetrachloride (OV)—6290 mg/m³—50 % rh—31.5 mg/m³—25 min—31.5/1888 mg/m³—1888 mg/m³

Chlorine (Cl₂)—1450 mg/m³—50 % rh—14.5 mg/m³—17.5 min—1.5/87.0 mg/m³—87 mg/m³

Chlorine Dioxide (ClO₂)—1380 mg/m³—50 rh—0.28 mg/m³—30 min—0.28/27.6 mg/m³—27.6 mg/m³

Chloropicrin (PS)—5000 mg/m³—80 % rh—5.0 mg/m³—27 min—0.67/26.9 mg/m³—26.9 mg/m³

Cyanogen chloride (CK)—2000 mg/m³—80 % rh—2.5 mg/m³—25 min—0.75C/ND (118) mg/m³—118 mg/m³

DMMP—3000 mg/m³—Dry—0.04 mg/m³—59 min—NA—NA mg/m³

Formaldehyde (CH₂O)—123 mg/m³—50 % rh—1.2 mg/m³—50 min—0.37C/36.9 mg/m³—36.9 mg/m³

Hydrogen chloride (HCl)—746 mg/m³—50 % rh—7.5 mg/m³—25 min—7.5C/149 mg/m³—149 mg/m³

Hydrogen cyanide (AC)—2000 mg/m³—80 % rh—1.011 mg/m³—25 min—5.2C/55.3 mg/m³—55.3 mg/m³

Hydrogen fluoride (HF)—57.3 mg/m³—50 % rh—2.5 mg/m³—30 min—2.5C/24.6 mg/m³—24.6 mg/m³

Methylamine (CH₃NH₂)—1270 mg/m³—50 % rh—12.7 mg/m³—25 min—6.4/127 mg/m³—127 mg/m³

Phosgene (CG)—20 000 mg/m³—80 % rh—8.0 mg/m³—9.4 min—0.40/8.1 mg/m³—8.1 mg/m³

Sarin (GB)—4000 mg/m³—50 % rh—0.04 mg/m³—83 min—0.0001/>0.2 mg/m³—0.1 mg/m³

Sulfur dioxide (SO₂)—1310 mg/m³—50 % rh—13.1 mg/m³—15 min—5.2/262 mg/m³—262 mg/m³

Particulates (high efficiency)—100 mg/m³—NA rh—<0.03% mg/m³—NA min—10 I/ND 3 R/ND mg/m³—10 000 mg/m³, 3000 mg/m³

Protection factor: LRPL testing not performed at the U.S. Army's Protection Factor Test Facility

DESIGN/CONFIGURATION

Visor: Loose fitting, single lens. Visor contains coatings to enhance scratch resistance, reduce fogging, or perform other functions. Spectacle kit not needed since personnel can wear glasses inside hood. Visor is rigid. Eye test meets performance criterion.

Field of View: The lightweight butyl rubber hood provides protection, excellent mobility, and visibility

Faceblank Material: Butyl rubber

Facepiece Compatibility: Not applicable

Blower Information:

- **Blower Mount:** Belt-mounted power unit assembly location is on the back. Mounting options include the belt and vest. Battery requires a separate mount. Noise generation of blower is <75 db.
- **Blower Weight:** Blower assembly (less battery)—0.816 kg (1.8 lb); battery—0.816 kg (1.8 lb)
- **Blower Interface:** Rear interface

Battery Life/Type: <8 h of continual use. Manufacturer specific (rechargeable)—rechargeable NiCad and lithium oxide disposable. There is an option for disposable or rechargeable batteries. Rechargeable batteries are available for training and disposable batteries are available for response operations.

Canister Configuration: Three canisters can be mounted to the blower. Canisters mount to the blower by 40 mm DIN. Canister change by screw in/screw out.

Interoperability with Equipment: Active communication equipment

Indicator Alarms: Alarms not available

HUMAN FACTORS

Communication: Equipment does not have a voice amplifier. Speech intelligibility testing has not been performed using NIOSH's test method.

Hydration: Not equipped with hydration capability

Sizes Available: One size fits all

Don/DoFF Information: Assistance not needed for donning/doffing. Average time is 31 s to 60 s. The hood can be worn with facial hair and glasses providing the facial hair does not protrude under the face seal or shroud.

Comfort/Weight: Weight of average configuration is 3636 g (8 lb). Turbo unit without filter/cartridge/canister approximately 830 g (1.8 lb). Battery pack (NiMH) approximately 830 g (1.8 lb). Battery pack (Lithium) approximately 450 g (1.0 lb). Approximate total weight is 3.64 kg (8 lb).

Training: <8 h provided by manufacturer. Loose fitting respirator does not require fit-testing. Respiratory equipment is not certified in the NFPA training procedure.

http://solutions.3m.com/wps/portal/!ut/p/kcxml/04_Sj9SPykssy0xPLMnMz0Q9KzYsPDdaPOI8yizeIINzIN1S_IcFQEALyzu94!

Manuals: Manual

LOGISTICS

Maintenance Required: After each use

Maintenance Cost: Minimal maintenance cost. Canister replacement is considered consumable item.

Use/Reuse: Equipment can be cleaned and reused with minimal effort. Procedures are available to decontaminate and/or dispose of used equipment. recertification NOT required by manufacturer.

Shelf Life: 6 yr to 10 yr; requires nothing more than normal storage conditions

Storage Conditions: 13 °C to 24 °C (55 °F to 75 °F); ≤85 % rh

Package Shape/Volume: ≤0.057 m³ (2.0 ft³). Cylindrical soft sided duffel bag (with or without straps).

Color: Not color coded

Health Hazards and Safety: BE-10BR Hood contains latex

MSDS: MSDS is available

Warranty: In the event any 3M OH&ESD product is found to be defective in material, workmanship, or not in conformance with any express warranty for a specific purpose, 3M's only obligation, and your exclusive remedy, shall be at 3M's option, to repair, replace, or refund the purchase price of such parts or products upon timely notification thereof and substantiation that the product has been stored, maintained, and used in accordance with 3M's written instructions.

Exclusions to warranty: This warranty is exclusive and is in lieu of any implied warranty of merchantability, fitness for a particular purpose or other warranty of quality, except of title and against patent infringement. Limitation of liability: Except as provided above, 3M shall not be liable or responsible for any loss or damage, whether direct, indirect, incidental, special or consequential, arising out of sale, use or misuse of 3M OH&ESD products, or the user's inability to use such products. The remedies set forth herein are exclusive.

GENERAL

ILC Dover First Receiver™ and Sentinel XL™**Model:** Sentinel XL™

ILC Dover, Inc.
 One Moonwalker Road
 Frederic, Delaware 19946-0428
 POC: LeRoy Garey
 302-335-3911, ext. 335 (Tel)
 302-335-0762 (Fax)
 gareyl@ilcdover.com

Source of Information: <http://www.ilcdover.com>**Availability:** Manufactured on demand**NIOSH Status:** Submitted for NIOSH 42 CFR, Part 84, Subpart I, Paragraphs 84.110-123) approval**Unit Cost (MSRP):** ~\$800—blower with integral battery pack, hood, hose, and 3 filters**Component Costs:** Component costs vary**Other Certifications:** The ILC PAPR has been submitted for NIOSH approval (for industrial 42 CFR, Part 84, Subpart I, Paragraphs 84.110-123)**Independent Testing:** Not specified**Configuration:** Components—Manufacturer—Part Number

- Blower unit—ILC—To be determined
- CBRN filters—To be determined—To be determined
- Battery pack—ILC—To be determined
- Flow meter—ILC—To be determined
- Waist belt/Back Pack—ILC—To be determined

PAPR Description: PAPR is high efficiency light weight, high quality, high reliability, small in size, with long operation time. Hood [chemical (butyl) or particulate only (Tyvek)].**PAPR Application:** Radiation, biological, deep frozen media, and CBRN. Can be used in atmospheres with less than 19.5 % oxygen concentration. Possibly with fused munitions and explosive atmospheres.**EOD Capability:** EOD compatibility has not been determined

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: ILC Dover's "Sentinel XL" will provide protection capability against all listed categories**Breathing Performance:**

- **Inhalation Resistance:** Moderate work rate (conventional) and high work rate. Rated flow output from the blower is moderate. Measured value of airflow resistance has not been determined but is less than or equal to 65 mm water column when tested at 85 L/min. Canister has 2 filters, one particle filter and one chemical filter. Inhalation resistance in the unblown configuration has not been determined.
- **Exhalation Resistance:** Equal to or less than 20 mm H₂O

Environmental Conditions: Battery has not been cold weather tested**Environmental Testing:** Environmental testing has not been done**Canisters:**

- **Canister Information:** Mask is capable of using 3 canisters (using 3 filters). Equipped with a P100 particulate filter. Has standard 40 mm threads.
- **Canister Capacity Rating:** To be determined
- **Canister Service Life:** Manufacturer does not provide tools for estimating canister service life and the effects of temperature/relative humidity on canister performance

Chemical Specific Canisters: Industrial gasses**Protection factor:** LRPL testing not performed at the U.S. Army's Protection Factor Test Facility

DESIGN/CONFIGURATION

Visor: Loose fitting hood single lens. Visor contains coatings to enhance scratch resistance, reduce fogging, or perform other functions. Spectacle kit is not provided—manufacturer states that there is no need because the user can use his own spectacles. Visor is flexible polycarbonate. Eye test meets visual acuity performance criterion. Can be worn by those with facial hair.

Field of View: Side field of view visor

Faceblank Material: To be determined

Facepiece Compatibility: Facepiece is not NIOSH certified for use with APR and SCBA

Blower Information:

- **Blower Mount:** Lightweight blower unit with integral battery pack. Assembly location on back or side. The user may choose to use a waist belt or a back pack. There are two or more mounting options. Battery integrated into the blower.
- **Blower Weight:** Blower assembly (less battery)—1.245 kg (2.74 lb) (including 3 canisters); battery—0.745 kg (1.64 lb)
- **Blower Interface:** Center/chin interface

Battery Life/Type: Battery features: rechargeable NiMH or nonrechargeable Li-MnO₂; 8 h of operation; end of life indicator; and smart charger technology. Lightweight blower unit with integral battery pack.

Canister Configuration: Three canisters can be mounted to the blower. Canisters mount to the blower by 40 mm (NATO) thread.

Interoperability with Equipment: To be determined

Indicator Alarms: Combination of visible, audible, or vibratory advanced warning provided by battery life indicator (30 min). Combination of visible, audible, or vibratory accidental shut-off protection for battery located on the blower unit in a visible location (30 min). Blower has low voltage alarm.

HUMAN FACTORS

Communication: Equipment does not have a voice amplifier. No test methods have been used to assess speech intelligibility.

Hydration: To be determined

Sizes Available: One size fits all

Don/Doff Information: Assistance not needed for donning/doffing. Average time is 0 s to 30 s.

Comfort/Weight: Blower assembly—1.99 kg (4.39 lb); respirator—to be determined

Training: Respiratory equipment is not certified in the NFPA training procedure. No training required.

Manuals: To be determined

LOGISTICS

Maintenance Required: After each use

Maintenance Cost: To be determined

Use/Reuse: Blowers can be cleaned and reused with minimal effort; respirator—to be determined. Easy to decon.

Shelf Life: ≥ 5 yr; requires nothing more than normal storage conditions

Storage Conditions: Requires nothing more than normal storage conditions

Package Shape/Volume: ≤ 0.057 m³ (2.0 ft³). Rigid (cardboard) and stores flat.

Color: Minimum order for custom colors: 1000

Health Hazards and Safety: No known health hazards

MSDS: MSDS is available

Warranty: Not specified

GENERAL

MSA OptimAir® 6HC PAPR**Model:** OptimAir® 6HC

Mine Safety Appliances Company
 PO Box 428
 Pittsburgh, Pennsylvania 15230-0428
 POC: Evan Erickson
 724-733-9274 (Tel)
 724-733-8573 (Fax)
 evan.erickson@msanet.com

Source of Information: <http://www.msanet.com>

NIOSH Status: TC-23C-2201 (basic 42 CFR 84 approval) with Tychem SL hood
 TC-23C-2209 (basic 42 CFR 84 approval) with Advantage 3100 facepiece

Unit Cost (MSRP): \$782**Component Costs:** Component costs vary**Other Certifications:** Not specified**Independent Testing:** Not specified**Configuration:** OptimAir 6HC PAPR with 10041551 hood, 10041489 blower, 10041488 battery, 481980 breathing tube, 10042445 cartridge, and 7-977-1 or 9961 belt

PAPR Description: The MSA OptimAir 6HC PAPR (Health Care Powered Air-Purifying Respirator) features an 8 oz lightweight, chemical-resistant Tychem SL Hood and belt-mounted blower with two HC cartridges. The hood, compatible with facial hair and glasses, requires no fit-testing. The canisters contain a pleated high-efficiency (P100) filter to remove aerosols, radionuclides, and solid particulates; and an impregnated activated carbon bed to adsorb (filter out) gases and vapors. The carbon bed is the same as used in military canisters and is effective against mustard (HD), sarin (GB), DMMP (a sarin simulant), HCN, and CK. The OptimAir 6HC PAPR includes HC CBA/RC cartridges (package of 6), breathing tube for hood, and polyurethane-coated nylon belt. Optional Advantage 3100 tightfitting facepiece.

PAPR Application: Designed to protect health care professionals from residual CBR Agents, when they are performing First Responder duties during Homeland Security or terrorist situations

EOD Capability: Not specified

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: Not specified**Breathing Performance:**

- **Inhalation Resistance:** Measured value of airflow resistance is less than or equal to 65 mm water column when tested at 85 L/min
- **Exhalation Resistance:** Equal to or less than 20 mm H₂O

Environmental Conditions: Not specified**Environmental Testing:** Not specified**Canisters:**

- **Canister Information:** Capable of using 2 canisters
- **Canister Capacity Rating:** Not specified
- **Canister Service Life:** Not specified

Chemical Specific Canisters: The canisters contain a pleated high-efficiency (P100) filter to remove aerosols, radionuclides, and solid particulates; and an impregnated activated carbon bed to adsorb (filter out) gases and vapors. CBA/RCA OptiFilter cartridges, box of 6.

Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Loose fitting, single lens

Field of View: Not specified

Faceblank Material: Not specified

Facepiece Compatibility: Not specified

Blower Information:

- **Blower Mount:** Single or multiple locations and single mounting option
- **Blower Weight:** 2727 g
- **Blower Interface:** Belt-mounted motor/blower module, polyurethane-coated nylon belt, flow check meter, and adapter for flow check meter for use with hood. Single or multiple locations and single mounting option.

Battery Life/Type: >8 h disposable or rechargeable. The maintenance-free single-use lithium battery has a 10 yr shelf life, 4 h wear time. A NiCd battery is available for training use. There is also an optional rechargeable NiCd battery with a single-unit single-rate battery charger for NiCd Battery.

Canister Configuration: Not specified

Interoperability with Equipment: Not specified

Indicator Alarms: No alarm capability

HUMAN FACTORS

Communication: Not specified

Hydration: Hydration capability

Sizes Available: One size fits all

Don/Doff Information: Not specified

Comfort/Weight: The entire PAPR weighs <2727 g (6 lb)

Training: Not specified

Manuals: Not specified

LOGISTICS

Maintenance Required: Not specified

Maintenance Cost: Not specified

Use/Reuse: Not specified

Shelf Life: Not specified

Storage Conditions: Not specified

Package Shape/Volume: $\leq 0.057 \text{ m}^3$ (2.0 ft³)

Color: Not specified

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: Not specified

GENERAL

TVI Corporation PureAir PAPR C8 PAPR System**Model:** C8 (01-06-000)

TVI Corporation
 7100 Holladay Tyler Road
 Suite 200
 Glenn Dale, Maryland 20769
 POC: Peter J. Cooper
 301-352-8800 (Tel)
 301-352-0910 (Fax)
 pcooper@tvicorp.com

Source of Information: http://www.tvicorp.com/Powered-Air-Respirators/PureAir_C8_1stReceiver.html; RKB

Availability: In stock—lead time 2 wk; minimum order 10 units



NIOSH Status: TC-21C-0778 (basic 42 CFR 84 approval)

Unit Cost (MSRP): \$825

Component Costs: Component costs vary

Other Certifications: Certified by NIOSH under 42CFR Part 84. Meets military standard (butyl hood).

Independent Testing: ICS Lab, Inc. Silica, fit test, noise test approximately 2004.

Configuration: PureAir C8 PAPR Butyl Hood System (NIOSH-approved system) includes: butyl soft top with neck cape; blower unit; breathing tube; low battery alarm/airflow indicator; nickel metal hydride battery, rechargeable; and comfortable lumbar support belt

PAPR Description: The NIOSH-approved PureAir C8 PAPR employs today's most innovative technology to ensure the wearer has maximum comfort, minimal restriction to vision, and delivers a maximum constant flow of air to minimize fatigue. The PureAir C8 PAPR is a loose fitting, positive pressure respirator headpiece. Designed to provide respiratory protection against particulates and airborne biological hazards. The C8 gives exceptional performance, lightweight comfort. Perfect for rapid deployment, easy to don and doff. Robust construction designed for first responders and first receivers. The C8's belt mounted motorized air system, delivers more air to the users breathing area than any other powered air unit on the market. Assisted clean air means longer periods on the job without "breather periods." Breathing tube is chemical resistant and flame retardant. Filter cover for protection against liquids.

PAPR Application: Particulate filtering; HEPA filter; has one replaceable filter

EOD Capability: PAPR is not EOD compatible

References: Not specified

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: The respirator will protect against vapor, liquid, and aerosol forms of CAs; against particulate, aerosol and liquid forms of BAs; against gaseous, vapor, aerosol and liquid forms of TICs/TIMs; and against radiological particulates

Breathing Performance:

- **Inhalation Resistance:** Constant flow, high breathing rate, and moderate breathing rate. Moderate work rate (conventional) and high work rate. Rated flow output from the blower is 8 ft³/min max. Measured value of airflow resistance is less than or equal to 65 mm water column when tested at 85 L/m. Canister has 3 filters. Inhalation resistance in the unblown configuration meets NIOSH standards.
- **Exhalation Resistance:** Equal to or less than 20 mm H₂O

Environmental Conditions: Battery has not been cold weather tested. No additional environmental testing.

Environmental Testing: Environmental testing has not been done

Canisters:

- **Canister Information:** Mask is capable of using 3 canisters. Equipped with a P100 particulate filter. Has standard 40 mm threads. Belt mounted. HEPA training canisters (3 pack) are NIOSH-approved with system).
- **Canister Capacity Rating:** Not specified
- **Canister Service Life:** 1 d to 4 d

Chemical Specific Canisters: HEPA (NIOSH-approved with system)

Protection factor: LRPL testing not performed at the U.S. Army's Protection Factor Test Facility

DESIGN/CONFIGURATION

Visor: Offers head and upper body protection, completely adjustable fit. Hood with front and rear bib. Single lens. 4 layers press polish vinyl. Spectacle kit is not provided since not needed. Visor has medium flexibility and is press polished vinyl. Eye test meets visual acuity performance criterion. Available as butyl (NIOSH-approved with system) or Tyvek® (not NIOSH-approved).

Field of View: 80 % to 89 % of unmasked FOV. VFS score and overlapping field-of-view to NIOSH standard.

Faceblank Material: 0.1016 cm (0.040 in) press polish vinyl (4 layers)

Facepiece Compatibility: Facepiece is not NIOSH certified for use with APR and SCBA

Blower Information:

- **Blower Mount:** Assembly location on back, front, or side. May be worn in any waist line location. There are two or more mounting options. Battery requires a separate mount. Noise generation of blower is 57 db. Comfortable lumbar support that can be decontaminated.
- **Blower Weight:** Blower assembly (less battery)—0.91 kg (2 lb)
- **Blower Interface:** Rear interface

Battery Life/Type: 4 h to 6 h of continual use, or optional 6 h to 12 h battery pack (14 h charge). Nickel metal hydride; fast charge; no memory retention; environmentally friendly end of life disposability; 30 % lighter than nickel cadmium cells; lithium battery with 10 yr shelf life; alkaline version available.

Canister Configuration: Three canisters can be mounted to the blower. Canisters mount to the blower by 40 mm DIN. Canister change by screw in/screw out.

Interoperability with Equipment: Not specified

Indicator Alarms: Low battery alarm and airflow indicator. High pitched audible alarm (92 dba) allows the user to be aware of low battery. Advanced warning (audible alarm) provided by battery life indicator for >15 min and <45 min. No accidental shut-off protection for battery. Signal can be fitted optimal and 15 min remain after alarm is activated.

HUMAN FACTORS

Communication: Equipment does not have a voice amplifier. No test methods have been used to assess speech intelligibility.

Hydration: Hydration capability is optional. Connector is compatible with standard M1 canteen cap.

Sizes Available: One size fits all

Don/Dooff Information: Assistance not needed for donning/doffing. Average time is 31 s to 60 s.

Comfort/Weight: Complete system weight is 0.680 kg (1 lb 8 oz)

Training: <8 h provided by manufacturer. Respirator does not require fit-testing. Respiratory equipment is not certified in the NFPA training procedure.

Manuals: Manual

LOGISTICS

Maintenance Required: Before and after each use and filters only. Battery maintenance requires changing every 3 mo.

Maintenance Cost: Minimal, \$200 every 2 yr

Use/Reuse: Equipment can be cleaned and reused. Disposal procedures are not available. Recertification is not required by manufacturer. Fully decontaminable.

Shelf Life: 1 yr to 5 yr

Storage Conditions: >-18 °C (30 °F to 68 F); less than 50 % humidity

Package Shape/Volume: ≤0.085 m³ (3.0 ft³). Soft sided oblong duffel bag.

Color: Butyl soft top with neck cape is military green and Tyvek® soft top with neck cape is white

Health Hazards and Safety: No known health hazards

MSDS: MSDS is available

Warranty: Blower has 12 mo warranty against manufacturing defects

GENERAL

Global Secure FR3 First Responder PAPR**Model:** FR3 (Tychem hood); FR3-84 (Butyl hood)

Global Secure Safety
 401 S. Main St
 Woodsboro, Maryland 21798
 POC: Jack Sawicki
 202-333-8400 (Tel)
 301-845-2777 (Tel)
 301-845-2213 (Fax)
 rvaughan@globalsecurecorp.com
 Left voice mail for Jack Sawicki on 12-28-06

Source of Information: <http://www.globalsecurecorp.com>
 Responder Knowledge Database

Availability: In stock



NIOSH Status: TC-21C-2092 (basic 42 CFR 84 approval)

Unit Cost (MSRP): \$600

Component Costs: Varies, depending on configuration

Other Certifications: Not specified

Independent Testing: Independently tested against war gases and NIOSH approved for a range of industrial gases and HEPA particulate protection. ICS Labs, SCC Inc. Phosgene, phosphine, NO, formaldehyde, SO₂, DMMP, CK cyclohexane, February 2005 through May 2005

Configuration: Butyl or Tychem Hood System PAPR combination multigas filters

PAPR Description: FR3 is a complete Tychem hood (white) respirator with battery back and three (3) super NBC canisters. NEO-FR3-84 is same as NEO-FR3 but with green butyl rubber hood. The FR3 is a battery powered respirator for disaster "first responders" and stand-by industrial emergency use (batteries included):

- Complete unit with Tychem SL Saranex hood and cape (butyl rubber hood optional), air supply tube, integrated blower, alkaline (optional lithium) battery pack, waist belt and three (3) "Super NBC" filter canisters
- "Super NBC" (Nuclear, Biological, and Chemical) canisters effective against certain levels of "war gasses" and potential terrorist agents such as nerve and tear gas
- NIOSH approved protection for P100 HEPA particulates, radon daughters, radio nuclides, organic vapors, chlorine, hydrogen chloride, sulfur dioxide, formaldehyde, ammonia and methylamine.
- Level "C" Respirator. NOT FOR USE in environments that are immediately dangerous to life and health.

The FR3-84 is a belt mounted powered air purifying respirator (PAPR) that is light weight and easy to use. The butyl rubber hood of the FR3-84 has a cape, inner neck seal and ratchet head gear. The hood has a side angled connector to the breathing tube for higher protection. Complete with hood, breathing tube, blower, battery pack, belt and three canisters.

PAPR Application: For rapid use by first responders in homeland security situations following accidents or terrorist acts involving nuclear, biological and chemical agents. Radiation, biological, deep frozen media, and chemical response. Products come with warnings not to use in atmospheres with less than 19.5 % oxygen concentration.

EOD Capability: PAPR is EOD compatible

References: Hospitals, first responders, police, HAZMAT teams, fire departments, state emergency organizations, EMS, and first receivers

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: The respirator will protect against vapor, liquid and aerosol forms of CAs. The respirator will protect against particulate, aerosol and liquid forms of BAs. The respirator will protect against radiological particulates.

Breathing Performance:

- **Inhalation Resistance:** Constant flow, moderate breathing rate, moderate work rate (conventional), and high work rate. Rated flow output from the blower is 180 L/min average. Measured value of airflow resistance is less than or equal to 65 mm water column when tested at 85 L/min.
- **Exhalation Resistance:** Equal to or less than 20 mm H₂O

Environmental Conditions: Common environmental conditions found in the field. Battery has not been cold weather tested.

Environmental Testing: Battery has been cold weather tested and subjected to hot diurnal, cold constant, humidity, vibration, and drop testing

Canisters:

- **Canister Information:** Mask is capable of using 3 canisters. FR3 First Responders PAPRs use the special NP5505 filtering din-thread canisters. Equipped with a P100 particulate filter. Has standard 40 mm threads.
- **Canister Capacity Rating:** Capacity #1. System does not offer additional performance for one or more of the TRAs.
- **Canister Service Life:** Must be used immediately. Additional testing is scheduled. Manufacturer does not provide any tools for estimating canister service life and the effects of temperature/relative humidity on canister performance.

Chemical Specific Canisters: The NP5505 filter can be used against organic vapors, sulfur dioxide, hydrogen chloride, chlorine, chlorine dioxide, hydrogen chloride, ammonia, methylamine, formaldehyde and has a high efficiency particulate filter (HEPA). It is also designed to filter all known CBR agents.

Ammonia—NP 5010—2500 ppm—80 %—12.5 ppm—64 L/min—>15 min

Cyanogen chloride—NP 5010—300 ppm—80 %—2 ppm—64 L/min—>15 min

Cyclohexane—NP 5010—2600 ppm—80 %—10 ppm—64 L/min—>15 min

Formaldehyde—NP 5010—500 ppm—80 %—1 ppm—64 L/min—>15 min

Hydrogen cyanide—NP 5010—940 ppm—80 %—4.7 ppm

Nitrogen dioxide—NP 5010—200 ppm—80 %—1 ppm—64 L/min—>15 min

Phosgene—NP 5010—250 ppm—80 %—1.25 ppm—64 L/min—>15 min

Phosphine—NP 5010—300 ppm—80 %—.3 ppm—64 L/min—>15 min

Sulfur dioxide—NP 5010—1500 ppm—80 %—5 ppm—64 L/min—>15 min

Protection factor: LRPL testing not performed at the U.S. Army's Protection Factor Test Facility

DESIGN/CONFIGURATION

Visor: Loose fitting with single lens. Interface gasket is composed of ethylene propylene-diene-monomer (EDPM).

Field of View: 90 % to 100 % of unmasked FOV (untested). Overlapping field-of-view to the unmasked is untested.

Faceblank Material: Hood

Facepiece Compatibility: Facepiece is not NIOSH certified for use with APR and SCBA. Certification as PAPR—APR—SCBA is planned. PAPR facepiece can be used with APR and SCBA. CBRN certification is planned.

Blower Information:

- **Blower Mount:** Assembly location on waist (back). Two or more mounting options. Battery integrated into the blower. Noise generation of blower <75 db.
- **Blower Weight:** Blower assembly (less battery)—0.318 kg (0.7 lb). Battery—0.77 kg (1.7 lb) for alkaline; 0.5 kg (1.1 lb) for lithium.
- **Blower Interface:** Right/left cheek (interchangeable)

Battery Life/Type: >8 h of continual use. Standard COT's battery, rechargeable, and manufacturer specific (disposable). Unit is available with lithium batteries or rechargeable NiCad's. The standard unit is shipped with alkaline D cells providing 8 h of continuous use. Replacement are available at local stores. Rechargeable batteries are available for training and disposable batteries are available for response operations. There is no battery life indicator. Optional lithium battery upgrade offers 20 h of protection.

Canister Configuration: Three canisters can be mounted to the blower. Canisters mount to the blower by DIN 40 connector. Canister change out is very easy.

Interoperability with Equipment: Not specified

Indicator Alarms: Advanced warning (audible alarm) provided by battery life indicator. Location of the signal is on battery. Performance of the indicators designed to -30 °C (-22 °F) not yet tested. Audible low flow alarm. Location of the signal is on blower.

HUMAN FACTORS

Communication: Equipment has a voice amplifier, not CBRN approved. Speech intelligibility testing has been performed using NIOSH's test method. Overall performance rating: 91.4.

Hydration: Connector is compatible with the standard M1 canteen cap

Sizes Available: Hood is one size fits all

Don/DoFF Information: Assistance not needed for donning/doffing. Average time is 0 s to 30 s.

Comfort/Weight: FR3: 3180 g (7 lb); FR3-84: 3220 g (7.1 lb)

Training: <8 h training available upon request. Hoods are loose fitting and do not require a fit test.

Manuals: Manual and CDs

LOGISTICS

Maintenance Required: After each use and at least annually

Maintenance Cost: \$60 estimated annual cost

Use/Reuse: Equipment can be cleaned and reused. Recertification NOT required by manufacturer.

Shelf Life: 6 yr to 10 yr; requires nothing more than normal storage conditions

Storage Conditions: 25 °C (77 °F); 50 % rh

Package Shape/Volume: $\leq 0.057 \text{ m}^3$ (2.0 ft³). Oblong soft sided duffle bag or rigid (cardboard).

Color: FR3 has white Tychem hood; FR3-84 has green butyl hood. Minimum order quantity required for color coding.

Health Hazards and Safety: No known health hazards

MSDS: MSDS is available

Warranty: Available upon request

GENERAL

TVI Corporation PureAir PAPR K7 PAPR System

Model: K7

TVI Corporation
7100 Holladay Tyler Road
Suite 200
Glenn Dale, Maryland 20769
POC: Peter J. Cooper
301-352-8800 (Tel)
301-352-0910 (Fax)
pcooper@tvicorp.com

Source of Information: http://www.tvicorp.com/Powered-Air-Respirators/PureAir_C8_1stReceiver.html; RKB

Availability: In stock—lead time 2 wk; minimum order 10 units



NIOSH Status: TC-21C-0789 (basic 42 CFR 84 approval)

Unit Cost (MSRP): Not specified

Component Costs: Component costs vary

Other Certifications: Certified by NIOSH under 42CFR Part 84

Independent Testing: Not specified

Configuration: NIOSH-approval system includes tight fitting full facepiece with breathing hose; 2 filter blower unit with standard 40 mm filter ports; comfortable lumbar support waist belt; high-pitched audible low battery/low flow alarm; airflow indicator; and 2 high efficiency (HE) filters

PAPR Description: NIOSH-approved tight-fitting facepiece system utilizes two HE (High Efficiency) filters. The K7 offers the protection of a tight fitting facepiece with the comfort and user acceptance of powered air. The lightweight motor blower provides increased airflow for comfortable, quiet operation. The system is designed to protect users against all biological and particulate hazards. Contaminated air is pulled through two high efficiency filters. The motor blower provides >6 cfm of purified air to the tight fitting facepiece providing increased protection, increased endurance, and a cooling effect. The use of a PAPR system often diminishes the feelings of claustrophobia associated with tight fitting masks.

PAPR Application: This system is ideal for protection in a hospital/first receiver environment, where biological protection is desired. It is also approved for and effective for use in industrial/commercial environments such as asbestos abatement, lead paint removal, and any application where fine particles, dust, or other aerosol contamination may exist.

EOD Capability: PAPR is not EOD compatible

References: Not specified

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: The respirator will protect against BAs and against particulates

Breathing Performance:

- **Inhalation Resistance:** Constant flow, high breathing rate, and moderate breathing rate. Moderate work rate (conventional) and high work rate. Rated flow output from the blower is 6 ft³/min max. Measured value of airflow resistance is less than or equal to 65 mm water column when tested at 85 L/m. Canister has 2 filters. Inhalation resistance in the unblown configuration meets NIOSH standards.
- **Exhalation Resistance:** Equal to or less than 20 mm H₂O

Environmental Conditions: Battery has not been cold weather tested. No additional environmental testing.

Environmental Testing: Environmental testing has not been done

Canisters:

- **Canister Information:** Mask is capable of using 2 canisters. Equipped with a P100 particulate filter. Has standard 40 mm threads. Belt mounted.
- **Canister Capacity Rating:** Not specified
- **Canister Service Life:** 1 d to 4 d

Chemical Specific Canisters: HEPA (NIOSH-approved with system)

Protection factor: LRPL testing not performed at the U.S. Army's Protection Factor Test Facility

DESIGN/CONFIGURATION

Visor: Tight fitting full facepiece with breathing hose

Field of View: Not specified

Faceblank Material: 0.1016 cm (0.040 in) press polish vinyl (4 layers)

Facepiece Compatibility: Facepiece is not NIOSH certified for use with APR and SCBA

Blower Information:

- **Blower Mount:** Assembly location on back, front, or side. May be worn in any waist line location. There are two or more mounting options. Battery requires a separate mount. Noise generation of blower is 57 db. Comfortable lumbar support that can be decontaminated.
- **Blower Weight:** Blower assembly (less battery)—0.91 kg (2 lb)
- **Blower Interface:** Front interface

Battery Life/Type: 4 h to 6 h or optional 6 h to 12 h battery pack (14 h charge). NiMH rechargeable battery. Same battery for training and/or incident response.

Canister Configuration: Two canisters can be mounted to the blower. Canisters mount to the blower by 40 mm DIN. Canister change by screw in/screw out.

Interoperability with Equipment: Not specified

Indicator Alarms: Audible alarm for low flow/low battery. Protects against remaining in contaminated area in the event of battery or filter failure.

HUMAN FACTORS

Communication: Equipment does not have a voice amplifier. No test methods have been used to assess speech intelligibility.

Hydration: Hydration capability is optional. Connector is compatible with standard M1 canteen cap.

Sizes Available: One size fits all

Don/DoFF Information: Assistance not needed for donning/doffing. Average time is 31 s to 60 s.

Comfort/Weight: Complete system weight is 0.482 kg (1 lb 1 oz)

Training: <8 h provided by manufacturer. As with all tight fitting facepieces, annual fit testing and proper training is required to ensure safe operation. Failure to properly fit and train users is dangerous and may be fatal. Be sure to follow all user instructions, warnings and cautions.

Manuals: Manual

LOGISTICS

Maintenance Required: Before and after each use and filters only. Battery maintenance requires changing every 3 mo.

Maintenance Cost: Minimal, \$200 every 2 yr

Use/Reuse: Equipment can be cleaned and reused. Disposal procedures are not available. Recertification is not required by manufacturer. Fully decontaminable.

Shelf Life: 1 yr to 5 yr

Storage Conditions: >-18 °C (30 °F to 68 F); less than 50 % humidity

Package Shape/Volume: ≤0.085 m³ (3.0 ft³). Soft sided oblong duffle bag.

Color: Not specified

Health Hazards and Safety: No known health hazards

MSDS: MSDS is available

Warranty: Blower has 12 mo warranty against manufacturing defects

APPENDIX N—SCBA DATA FIELDS

APPENDIX N—SCBA DATA FIELDS

Forty-one data fields were used to provide information relating to CBRN NIOSH approved SCBAs. The 41 data fields are comprised of data fields from the market survey vendor questionnaire requesting specifics about their CBRN SCBAs. All data fields from the market survey were developed using input from the emergency responder community. Because of the database limitations, several data fields on the vendor questionnaire were combined, but all the vendor-supplied information was entered into the database.

The data fields are grouped according to the following five parameters and the number of data fields in each parameter:

- General (14 data fields).
- Operational Capabilities (2 data fields).
- Design/Configuration (9 data fields).
- Human Factors (4 data fields).
- Logistics (12 data fields).

1.0 General

1.1 Product Information

Product information, including name, model, and/or stock number, is used to identify the SCBA. The stock and/or model number indicates the number(s) that are used to uniquely identify the equipment. It should include the stock identification or national stock number, if the SCBA has one.

1.2 Manufacturer

Manufacturer identifies the company that manufactured the SCBA (to include the name, address, telephone number(s), fax number, and point-of-contact).

1.3 Source

Source indicates where the SCBA information was obtained. Potential sources include past market surveys, internet websites, conferences, or commerce business daily announcements.

1.4 Information Last Updated

This data field indicates when the information was last updated by the vendor.

1.5 NIOSH CBRN Certification

SCBAs submitted for NIOSH CBRN certification must meet the following approvals and certifications for NIOSH CBRN SCBA: requirements to CBRN SCBA 42 CFR, Part 84, Subpart H; compliance with National Fire Protection Association (NFPA) Standard 1981 for Open-

Circuit Self-Contained Breathing Apparatus for Fire and Emergency Services (2002 Edition) or NFPA Standard 1981 (1997 Edition); and approval of the SCBA to 42 CFR Part 84.63(c) special tests as defined under 42 CFR Part 84.63(c). Special tests include the following:

- *Chemical agent permeation and penetration resistance against distilled sulfur mustard (HD) and sarin (GB).*
- *Laboratory respirator protection level (LRPL).*

1.6 NIOSH CBRN Certification Information

This data field provides the NIOSH CBRN certification number and the date of certification, or, if pending certification, the date of expected certification.

1.7 Certification as an Assembly

The complete CBRN SCBA assembly and subassemblies must be composed of only those component parts that are part of the individual CBRN SCBA approval. Examples of parts include redundant, dual, and primary air-pressure gauges; cylinder neck valve assemblies; cylinder types; respirator end of (remaining) service time indicators (EOSTI); rapid intervention crew (RIC) fittings; and by-pass purge valves. Accessories may include electronic voice amplifiers, hardwire communications devices, spectacle kits, integrated PASS, stand alone PASS, fire service rescue belts, and facepiece foam seal inserts.

1.8 Other Certifications

Other certifications include applicable testing and certifications [include testing organization(s) and standard(s) such as mil-standards].

1.9 Independent Testing

Independent testing information includes any test data obtained from sources regarding any part of the equipment (e.g., validation testing including materials and ensemble testing such as abrasion, tear, wear, burst, and permeation testing). Human factors testing results should be included as well (either quantitative or qualitative).

1.10 SCBA Description

The SCBA description category provides an overall description of the SCBA. Descriptions should include any features that make the APR unique.

1.11 SCBA Application

This data field identifies the areas where the SCBA is most likely to be used per vendor or manufacturer recommendation (e.g., tactical operations, crisis management, etc.) or those areas where the SCBA R should not be used (i.e., in a flammable environment, etc.). Also included will be the ability of the respiratory equipment to be used with an EOD protective ensemble. This

data field will provide specific guidance and warnings that relate to the use of the respiratory equipment in atmospheres with less than 19.5 % oxygen concentration.

1.12 Unit and Component Cost (MSRP)

Unit and component costs include details on the complete respiratory system cost, as well as costs of individual components (e.g., voice amplifiers, spectacle holders, etc.).

1.13 Availability

Availability indicates the lead time for acquiring initial quantities of the SCBAs after the order has been placed, as well as repair and maintenance parts. Provide if the equipment is disposable or nondisposable.

1.14 References/User(s) of Product

*References/user(s) of product identifies organizations (i.e., military use, commercial applications, civil-service instrument, etc.) that are currently using the piece of equipment. This information may include the average number of units each client has in operation and the average number of years these units have been in use. **References must be verified with consent from the users before including the contact information.***

2.0 Operational Capabilities

2.1 Hazard/Threat Protection Categories

This data field provides references to the protection capability of the respiratory equipment to protect against CBRN and TICs/TIMs. This data field includes both the duration rating of the SCBA as well as the pressure rating of the cylinder.

2.2 Protection Factor

This data field addresses the ability of the respirator to effectively seal to the wearer. The information is based on the results of the LRPL testing per the NIOSH test method. The CBRN standard contains minimum requirements for LRPL. This test is performed with a panel of human subjects with a variety of facial sizes. The subjects don the mask and enter a chamber containing a corn oil aerosol challenge. The subjects perform a series of exercises while the in-mask aerosol concentration is measured permitting determination of the LRPL (Standard Test Procedure (STP) as prescribed in 42 CFR, Part 84, Subpart G, Section 84.63(a), (c), & (d); Federal Register, Volume 60, Number 110, June 8, 1995).

3.0 Design/Configuration

3.1 Visor

The visor data field indicates if the lens is a single or dual ocular lens, and provides the name of the material used to fabricate the visor. Other visor information includes the hardness or

flexibility of the visor, infrared protection, and compatibility with other equipment, such as the availability or accommodation of optical inserts, head lamp attachments and communication devices, as well as whether the lens is made from antifogging material and is it scratch resistant.

3.2 Visibility

Visibility includes visual acuity and impact on the field of view (FOV) as a percentage of visibility that the user has while wearing a respirator. Visual acuity for a person with 20/20 vision, either corrected or uncorrected, should be at least 20/35 while looking through a lens. An expected FOV is at least 70 % while looking through a lens. The data field will also provide the visual field score (VFS) as determined using the NIOSH APR CBRN standard.¹

3.3 Field of View

Visibility includes visual acuity and impact on the field of view as it applies while looking through a visor. The type of lens can also affect visibility. This data field will indicate the field of view as a percentage of visibility that the user has while wearing a respirator. An expected field of view is at least 70 % under these conditions. The data field will also provide the visual field score (VFS) as determined using the NIOSH PAPR CBRN standard.²

3.4 Facepiece Compatibility

This data field will indicate the ability to use the SCBA facepiece with other types of respirators, such as an APR or PAPR. It will also indicate whether the mask can be used for multiple platforms or if separate masks, even if identical, required for each platform.

3.5 Heads-Up Display (HUD)

The heads-up display (HUD) is a design requirement for SCBA compliant to NFPA 1981, 2002 edition. The HUD must display the remaining quantity of breathable air, a measure of the real time cylinder pressure and alert the user when the remaining quantity of breathable air is less than 50 % full. This data field describes the features associated with HUD (i.e., mounted on inside or outside of facepiece, wireless or integral wiring, indicator display, and battery type, battery life.

3.6 Interoperability with End User Equipment

This data field considers the number and types of equipment that can be used with the SCBA. Examples of end user equipment include head lamps and active communication equipment.

3.7 Battery Life

Battery life is the length of time it takes to recharge the battery, and if there is a fast recharge option.

¹ NIOSH Standard Test Procedure CET-APRS-STP-CBRN-0314

² NIOSH Standard Test Procedure CET-PAPRS-STP-CBRN-0314

3.8 Battery Type

This data field indicates the type of battery required by the blower. Batteries can be disposable, rechargeable, inexpensive and readily available from any retail store, or manufacturer specific batteries. Indicate the ability of the batteries to be interchanged with rechargeable batteries, and the ease at which the batteries can be swapped out in the field.

3.9 Indicators and Alarms

The CBRN concept paper specifies the PAPR must be equipped with a low battery indicator that alerts the user when 15-min but not more than 45-min of operational battery life remains, as well as a low flow indicator that alerts the user when airflow in the breathing zone reaches the minimum flow to maintain positive pressure. The indicator can be active or passive and include vibratory, audible, and/or visible. User preference is for audible and/or visible alarms and indicators rather than a vibration alarm. Location of the alarm is an important consideration to this criterion.

4.0 Human Factors

4.1 Communications

The concept paper has a minimum requirement for speech intelligibility. All CBRN approved models must meet a minimum requirement for passive communication (without the aid of electronic communication or extended devices). Any accessory must be included on the CBRN approval for use. Communications interface capability refers to the ability of the ensemble to interface with a communications system (network capability; hardwire capability; RF communication, etc.).

4.2 Sizes Available

Sizes available refer to the variety of facepiece sizes available to the first responder community. There should be enough sizes to adequately fit most of the members of the response team, both male and female (XS).

4.3 Don/Doff Information

The Don/Doff Information indicates length of time required to don or doff the respirator. Although donning is not as critical for the mission (unless of an emergency) doffing time is especially important in decontamination operations. The speed and ease of removing the equipment from oneself as well as those rescued from contaminated areas may be critical.

4.4 Comfort/Weight

Comfort of the SCBA ensemble is based on the fit of the facepiece and the weight distribution of the SCBA system (i.e., blower, hoses, etc.).

5.0 Logistics

5.1 Training

Training refers to the training available from the manufacturer. This includes any initial training and recertification training that is available. Training considers initial outfit testing and the man hours required to get certification to use the equipment. The availability of sustained training for the unit, annual or periodic, is also part of training criterion.

Indicate if your organization stresses to potential customers the importance of developing a written respiratory protection program that must be implemented in meeting all the requirements of OSHA 29 CFR 1910.134, including training, medical evaluation, and fit testing.

5.2 User Instructions Manual

A user instructions manual must be used in conjunction with the matrix-style label for the respirator to define the approved configuration.

5.3 Maintenance Requirements

Maintenance requirements are the services and parts required to keep the system at its peak operational readiness (e.g., preventative maintenance). This is important for SCBA systems for maintaining battery performance during storage. Following each use, respirators should be cleaned, disinfected, and stored according to the manufacturer's instructions. Include whether maintenance personnel are available in the field to do extensive maintenance on site, or must the item be sent back to the manufacturer for repairs.

5.4 Maintenance Cost

Maintenance cost is the cost required to maintain the system at its operational readiness. This cost will be based on equipment usage rates (i.e., cartridges, hoses, cylinders, etc.).

5.5 Use/Reuse

Use/reuse indicates the need for any part of the equipment to be discarded after use or its ability to be reused. Provide the availability of procedures to decontaminate and/or dispose of the equipment if it were used in a contaminated environment.

5.6 Shelf Life

Shelf life is the length of time the ensemble can be stored before it needs to be replaced. Shelf life should be in terms of years, or fractional years.

5.7 Storage Conditions

Provide the recommended storage conditions, as well as any factors that decrease shelf life (e.g., UV, critical temperature).

5.8 Packaging, Volume, and Shape

The package size and volume data field provides the external dimensions of the respirator and components when packaged (for storage and transportability). Package shape is also important when considering storing and transporting the respiratory equipment. Requirements may differ if the product package will be stored in a warehouse or on a vehicle.

5.9 Health Hazards and Safety

The health hazards data field identifies all materials that possess a potential health hazard. An example of potential health hazard is the use of latex, an allergen.

5.10 Material Safety Data Sheet

An MSDS is required if any of the materials used to manufacture the equipment possess a potential health hazard.

5.11 Color

The color data field indicates if the color of the cylinder, coded for a specific size or pressure.

5.12 Warranty

Warranty is the length of time the SCBA is guaranteed by the manufacturer, including the terms of the warranty (parts and labor). This data field also includes specific details on what is covered in the warranty, along with the effective lifetime of the warranty, any restrictions in place by the manufacturer, the specific parts and labor that are covered, and the expected useful lifetime of the equipment.

APPENDIX O—SCBA INDEX AND DATA SHEETS

APPENDIX O—SCBA INDEX AND DATA SHEETS

ID#	Name	Manufacturer	Page O-#
1	Dräger AirBoss™ Evolution Plus and AirBoss™ PSS100 Plus	Dräger Safety, Inc.	O-1
2	Global Secure Pioneer Pro	Global Secure Safety (Filtered Air) Corp.	O-4
3	ISI Viking DX/DXL	International Safety Instruments	O-6
4	ISI Viking ST	International Safety Instruments	O-9
5	Interspiro Spiromatic S4	Interspiro	O-12
6	Interspiro Spirotek T4	Interspiro	O-14
7	MSA Custom 4500 MMR Xtreme CBRN Air Mask with FireHawk Regulator	Mine Safety Appliances Company	O-16
8	MSA Ultralite MMR Xtreme CBRN Air Mask with FireHawk Regulator	Mine Safety Appliances Company	O-19
9	Scott Scott Air-Pak®	Scott Health and Safety	O-21
10	Scott NxG ₂ ™ Air-Pak	Scott Health and Safety	O-23
11	Survivair Panther CBRN SCBA	Survivair (a Division of Bacou USA Safety, Inc.)	O-25
12	SuperCritical Air Mobility Pack (SCAMP) SCBA Open Cycle	Supercritical Thermal Systems, Inc.	O-28

GENERAL

Dräger AirBoss™ Evolution Plus and AirBoss™ PSS100 Plus**Model:** High pressure (4500 psig) and low pressure (2216 psig)

Dräger Safety, Inc.
101 Technology Drive
Pittsburgh, Pennsylvania 15275
Julie Malinowski
412-788-8383 (Tel)
412-788-2207 (Fax)
julie.malinowski@draeger.com

Information Source: Responder Knowledge Database
<http://www.draeger.com>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnapproved/scba/default.html#list>

Vendor Status: The vendor has responded**Availability:** Manufactured on demand; 2 wk to 4 wk lead time; minimum order of 1 SCBA**NIOSH Status:** NFPA 1981 (2002 Edition)**NIOSH CBRN Number(s):**

TC-13F-512CBRN (2216 psig, 30 min)
TC-13F-513CBRN (4500 psig, 30 min)
TC-13F-514CBRN (4500 psig, 45 min)
TC-13F-515CBRN (4500 psig, 60 min)

Certification Date:

6/1/2004

Breathing Air Cycle (PSIG):

- 4500 psig
- 2216 psig

Duration Rating:

- 30 min
- 45 min
- 60 min

Unit Cost: Variable from \$4K to \$6K depending on components**Other Certifications:** SEI—NFPA 1981 (2002 Edition) Draeger AirBoss Evolution Plus and Evolution PSS100 Plus SCBA, January 4, 2005, SBA-DRA-02

SEI—NFPA 1981 (2002 Ed) and NFPA 1982 (1998)—Super I-PASS II and Sentinel, January 25, 2005, SBA-DRA-02-Variant10

Configuration Tested: Panorama Nova P Black EPDM Facepiece and LDV Assembly

CBRN LDV no quick release—3352572—\$370

CBRN LDV quick release—3352571—\$369

20 in multilink (buddy breather)—4057092—\$340

40 in multilink (buddy breather)—4057093—\$361

Integrated Super IPASS—4056812—\$706

AirBoss Sentinel II—3352000—\$1484

BAcomm amplifier—4056197—\$411

BAcomm ear speaker/PTT—4056200—\$562

Panorama nova facepiece—4052955—\$252

2216 psi cylinder valve—\$181

Foam gasket for facepiece—3353568—\$2.25

Gauge—3352002—\$179

Spec kit—R51548—\$95

Related Ensembles: Kappler Zytron™ 500 Z5HTN NFPA 1994 Class 1 Certified Ensemble

DuPont Tychem® Responder NFPA 1994 Class 1 Fully Encapsulated Level A Suit

DuPont Tychem® Responder® NFPA 1991 Fully Encapsulated Level A Ensembles

DuPont Tychem® TK Fully Encapsulated Level A suit (TK612T)

DuPont Tychem® TK Fully Encapsulated Level A suit (TK613T)

PAPR Description: Features ergonomic design and a wireless heads up display inside the facepiece. Optional Sentinel II provides gauge and PASS in one device as well as providing minutes remaining until low pressure alarms activate (minutes based on users breathing rate). The Sentinel also offers thermal absorbed temperature, temperature alarms and 2 of the SCBAs

4 low pressure alarms. Features ergonomic design, which includes a height adjustable backplate and a swiveling waist belt to maintain the weight of the unit on the hips and a wireless heads up display inside the facepiece. Optional Sentinel II provides gauge and PASS in one device as well as providing minutes remaining until low pressure alarms activate (minutes based on users breathing rate). The Sentinel also offers thermal absorbed temperature, temperature alarms and 2 of the SCBA's 4 low pressure alarms.

PAPR Application: Flammable environment, fused munitions, explosive atmospheres, IDLH environments or atmosphere with less than 19.5 % oxygen concentration, radiation, biological, deep frozen media, and other

Cylinder Options: Can be used underwater without losing positive pressure in the facepiece

EOD Capability: The SCBA can be worn with the Med Eng EOD ensemble without interfering with the face shield

References: City of Baltimore Fire Department—385 units—5 yr—Doug Campbell—410-396-9983

Memphis Fire Department—510 units—2 yr—Chief Yabro—901-320-5350

Palm Beach County Fire Rescue—400 units—6 yr—Capt Brad Havrilla—561-616-6935

Anchorage Fire Department—260 units—7 yr—Mark Lewis—907-267-5008

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: CA, BA, TIC/TIM, and radiological

Protection factor: LRPL testing performed at U.S. Army's Protection Factor Test Facility. 95 % of test subjects exceeded 2000; range of LRPLs is 2940 to 100 000; and 95 % of the test subjects exceed an LRPL of 500.

DESIGN/CONFIGURATION

Visor: Visor contains coatings to enhance scratch resistance and reduce fogging; spectacle kit is available; rigid polycarbonate visor

Field of View: 92 %—FOV. Visual acuity meets eye test performance criterion.

Facepiece Compatibility: NIOSH certified for use with an APR—APR filters; same mask can be used for multiple platforms. Rapid adapter allows for the use of APR filters with the SCBA mask.

Interoperability with Equipment: Head lamps; active communication equipment

Heads up Display: The HUD is located inside the mask and is a wireless system. It uses Lithium CR2 batteries. The transmitter has a 7 mo battery life, and the in-mask receiver has a 6 mo battery life. Four LEDs give cylinder content indication:

Full to 76 %—2 green, 1 amber, and 1 red are illuminated.

75 % to 51 %—1 green, 1 amber, and 1 red are illuminated.

50 %—amber will blink to give an alarm.

50 % to 26 %—1 amber and 1 red are illuminated.

25 %—1 red is illuminated and flashes until unit is depressurized.

Two additional LEDs indicate low battery—one for the transmitter and one for the receiver.

Battery Requirements: HUD uses lithium CR2 batteries—89 h battery life when in use; Sentinel II uses 9 V batteries—100 h battery life when in use; and Amplifier uses AAA batteries—8 h of talking time

Indicator Alarms: Combination of visible, audible, or vibratory alarm for low cylinder pressure; whistle on the 1st stage reducer, HUD LED in facepiece, strobes and electronic tone in Sentinel II. Performance of the indicators has been tested under cold conditions [-30 °C (-22 °F)].

HUMAN FACTORS

Communication: CBRN approved voice amplifier. Speech intelligibility testing has been performed using NIOSH's test method; unit passed with standard stainless steel speech diaphragm, and internal microphone of amplifier (amp turned off).

Sizes Available: One size fits all

Don/Doff Information: No assistance needed; 0 s to 30 s to don or doff

Comfort/Weight: Weight of equipment—4.54 kg (10 lb)

Weight of components—6.36 kg (14.02 lb) includes 30 min carbon cylinder, 20 in multilink with pouch, voice amplifier, and spec kit

Weight as worn—10.9 kg (24.02 lb)

Training Requirements: <8 h training required for operator to become proficient in using the equipment. Training may or may not be provided by manufacturer. Respirator requires fit-testing. Respiratory equipment is certified in the NFPA training procedure.

Training Available: Operational training, Level I (minor repair), Level II (service technician), Level III (first stage reducer), and Train the trainer and available. Customized training is provided (as an additional cost or included as part of the sale).

Manuals: Training manuals are available. Maintenance manuals are available as hard copy and/or electronic.

LOGISTICS

Maintenance Required: General surveillance required before and after each use; flow testing, replace ballnose o-ring (both annually)

Maintenance/Technical Support: Maintenance manual (hard copy and/or electronic); 24 h tech support available, and all contact information is available to customers; field maintenance available

Maintenance Cost: \$5.85 per unit per year based on actual customer data

Use/Reuse: Equipment can be cleaned and reused with minimal effort; annual flow testing as per NFPA; comprehensive equipment performance inspection recommended; decontamination and/or disposal procedures are available

Shelf Life: Greater than or equal to 15 yr; 15 yr is the lifespan of the composite cylinders

Storage Conditions: -32 °C to 71 °C (-25 °F to 160 °F)

Package Shape/Volume: 28 cm x 50 cm x 72.6 cm (11 in x 19.7 in x 28.6 in) rigid (metal or plastic) package

Color: Cylinders can be any color to meet customer requirements—minimum order of 5

Health Hazards and Safety: No latex or other allergens

MSDS: MSDS not available

Warranty: Lifetime—first and second stage reducers. 10 yr for elastomer parts and harness; 3 yr for Sentinel and HUD; 1 yr for spare parts; 0 yr for consumables such as o-rings, lens, headstrap, and batteries.

GENERAL

Global Secure Pioneer Pro

Model: 2002

Global Secure Safety (Filtered Air) Corp.
401 South Main Street
PO Box 128
Woodsboro, Maryland 21798
877-840-1469 (Tel)
301-845-2777 (Tel)
301-845-2213 (Fax)
Lou Richio (Engineer)
Global Secure Safety Products, Inc.
2020 Firedancer Lane
Bear, Delaware 19701
302-325-1190 (Tel)
302-325-1198 (Fax)
info@globalsecurecorp.com

Information Source:

<http://www.globalsecurecorp.com/index.asp>
http://www.seinet.org/CPL/nfpa198102_82.htm

Vendor Status: The vendor has not responded



NIOSH Status: NFPA 1981 (2002 Edition)

NIOSH CBRN Number(s):

NFPA 1981 (2002 Edition)

Certification Date:

Not specified

Breathing Air Cycle (PSIG):

Not specified

Duration Rating:

Not specified

Unit Cost: Not specified

Other Certifications: http://www.seinet.org/CPL/nfpa198102_82.htm

Integrated PASS/SCBA—NFPA 1981 (2002 Edition) and NFPA 1982 (1998 Edition)

Configuration Tested: Not specified

Related Ensembles: Not specified

PAPR Description: PASS portion of integrated PASS/SCBA is designed to be readily removed from the SCBA to be used alone.

The PioneerPro SCBA offers maximum comfort, easy breathing, communication, visibility, and a low profile facepiece with enhanced visibility as well as being lightweight to the user. The patented air delivery systems and the exclusive back mounted second stage positive pressure regulator provides air flow to the facepiece while eliminating the need for a mask mounted regulator. Our second stage also eliminates the need for regulator cleaning and maintenance. First ever fully automatic SCBA—no buttons, knobs, flaps, or hose couplings

PAPR Application: Not specified

Cylinder Options: New carbon cylinder reduces weight and profile

EOD Capability: Not specified

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: Not specified

Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Better vision, more face-piece scratch resistance

Field of View: Better vision, more face-piece scratch resistance

Facepiece Compatibility: Not specified

Interoperability with Equipment: Not specified

Heads up Display: AlertAIR’s on-board computerized sensor system actively monitors cylinder pressure, and projects status of cylinder pressure remaining into the user’s peripheral vision with our patented Heads Up Display (HUD). The heart of the AlertAIR system is its on-board computer, housed in a super-rugged, water tight case under the protective shadow of the cylinder on the SCBA back plate assembly. The computer translates the sensed pressure into quarter-tank increments, and sends this information to the HUD, mounted atop the breathing hose QD. As each quarter of the cylinder is expended by the user, the corresponding LED light goes OFF. The lights go off in sequence from left to right, full to empty. The HUD color scheme offers a firefighter discovered benefit. When the pressure drops to half and both green lights have gone out, the color “hue” in the user’s peripheral vision shifts from an “averaged” hue of green to an “averaged” hue of red. This shift is quite noticeable and alerts the user that he has just spent one half of his available time on that cylinder.

Battery Requirements: Longer battery life—1 yr or more on AlertAIR for most users

Indicator Alarms: Low air alarm both sound and light. Low battery warning included for both PASS and on-board computer. When the cylinder reaches 1/4 capacity, and at the same moment the low air warning alarm begins to sound, the red LED light begins to flash with double intensity, like brake lights on your car at night, insuring the user notices the low-air condition. Integrated PASS offers unique firefighter demanded features—located to radically reduce “false alarming,” compared with competitive units with motion sensors located close to the user’s back bone. When installed, IPASS activates blue LED light in AlertAIR HUD. Blue light only activated when PASS self-diagnostic comes back positive, and circuit continuity check through computer is confirmed (patent pending). Blue LED flashed when PASS pre-alerts or alarms. PASS automatically activates when user hooks up breathing air QD to face piece, increasing battery life 300 %. PASS stays activated regardless of cylinder pressure status. Once activated, it can only be deactivated by resetting manual control. PASS units are interchangeable, allowing complete freedom to mix and match PASS and SCBA. Flexible mounting location, alternative location to shoulder straps available.

HUMAN FACTORS

Communication: Easier talking

Sizes Available: Not specified

Don/Doff Information: Not specified

Comfort/Weight: Human factors design providing maximum comfort and full body motion

Training Requirements: Not specified

Training Available: Not specified

Manuals: Not specified

LOGISTICS

Maintenance Required: Not specified

Maintenance/Technical Support: Not specified

Maintenance Cost: Not specified

Use/Reuse: Not specified

Shelf Life: Not specified

Storage Conditions: Not specified

Package Shape/Volume: Not specified

Color: Not specified

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: The option of the industry’s only Lifetime Pneumatic Warranty

GENERAL

ISI Viking DX/DXL**Model:** 300012, 300013, 300014, and 300011

International Safety Instruments
 922 Hurricane Shoals Road
 Lawrenceville, Georgia 30043
 Mark Williamson
 888-ISI-SAFE (Tel)
 770-963-2797 (Fax)
 markw@intsafety.com

Information Source: Responder Knowledge Database
<http://www.intsafety.com>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnapproved/scba/default.html#list>

Vendor Status: The vendor has responded

Availability: Manufactured on demand; 4 wk lead time; each order must be \$100 or more

**NIOSH Status:** NFPA 1981 (2002 Edition)**NIOSH CBRN Number(s):**

TC-13F-521CBRN (4500 psig, 30 min)
 TC-13F-522CBRN (4500 psig, 45 min)
 TC-13F-523CBRN (4500 psig, 60 min)
 TC-13F-520CBRN (2216 psig, 30 min)

Certification Date:

3/11/2004

Breathing Air Cycle (PSIG):

- 4500 psig
- 2216 psig

Duration Rating:

- 30 min
- 45 min
- 60 min

Unit Cost: Viking DXL—CB40502010101A—\$4.98K

Viking DXL—CB40602010101A—\$5.25K

Viking DXL—CB40702010101A—\$5.57K

Viking DXL—CB50302010101A—\$4.95K

Voice Amplification—No charge

Radio Interface Option—\$278

Buddy Breathing—\$220

Spectacle Kit—\$71

Airline, Hansen HK Fittings—\$247

Airline, CEJN Fittings—\$247

PASS (Viking DXL Only)—\$221

SCBA Carrying Case—\$108

Radion Interface Cables—depends on radio type and model

Other Certifications:

- 1) SEI—NFPA 1981 (2002 Ed) and NFPA 1982 (1998 Ed)—ISI PASS Portion: Integrated ISI Pass
- 2) SEI—NFPA 1981 (2002 Ed)—Viking SCBA, July 18, 2005, SBA-ISI-03
- 3) SEI—NFPA 1982 (1998 Ed)—ISI SCBA w/ PASS Portion: DuoPass II or T-PASS, June 28, 2004, SBA-ISI-03-Variant10
- 4) UL913

Configuration Tested: See assembly matrix (Part number 084085—Viking CBRN SCBA NIOSH Approval Information Sheet)

Related Ensembles: Viking SCBA:

DuPont Tychem® Responder NFPA 1994 Class 1 Fully Encapsulated Level A Suit

DuPont Tychem® Responder® NFPA 1991 Fully Encapsulated Level A Ensembles

DuPont Tychem® TK Fully Encapsulated Level A suit (TK612T)

DuPont Tychem® TK Fully Encapsulated Level A suit (TK613T)

Viking ST SCBA:

Kappler Zytron™ 500 Z5HTN NFPA 1994 Class 1 Certified Ensemble
DuPont Tychem® Responder NFPA 1994 Class 1 Fully Encapsulated Level A Suit
DuPont Tychem® Responder® NFPA 1991 Fully Encapsulated Level A Ensembles
DuPont Tychem® TK Fully Encapsulated Level A suit (TK612T)
DuPont Tychem® TK Fully Encapsulated Level A suit (TK613T)

PAPR Description: The Viking DXL SCBA is designed for the fire service. The unit incorporates the AirSwitch facemask and regulator, easy donning harness, heads-up display for low air and built in communications. An additional feature incorporated into the Viking DXL is a PASS. Radio interface is an option on the unit and the Voice Amplification comes standard at no additional charge.

PAPR Application: Flammable environment, fused munitions, explosive atmospheres, IDLH environments or atmosphere with less than 19.5 % oxygen concentration, radiation, biological, deep frozen media, and other

Cylinder Options: No details

EOD Capability: The Viking ST has been tested by Med-Eng with the SRS-5 Helmet and it is the only SCBA that had an overall rating to use

References: Riverside County, CA Sheriffs—37 units—1 yr—Ron Berry—951-922-7660

Los Angeles Airport—9 units—1 yr—Sgt. Robert Rios—310-646-5252

Seminole County Sheriffs—34 units—2 yr—Ed Allen—407-665-6600

Valparaiso, IN fire Dept.—35 units—1 yr—Chief Steindler—219-462-8325

Great Falls, MT Fire Dept.—40 units—1 yr—Jim Hirost—406-727-0870

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: CA, BA, TIC/TIM, and radiological

Protection factor: LRPL testing performed at U.S. Army's Protection Factor Test Facility. An overall 97.37 % passing percentage was attained; individual reports not received; and 95 % of the test subjects exceed an LRPL of 500.

DESIGN/CONFIGURATION

Visor: Visor contains coatings (anti-scratch on the outside and anti-fog on the inside); spectacle kit is available (adjusts vertically and horizontally); rigid polycarbonate visor; visor is a double curved sphere which is optically correct

Field of View: 90 % to 100 %. Field of view is different for each individual, depends on face size and facial features. Visual acuity meets eye test performance criterion.

Facepiece Compatibility: NIOSH certified for use with an APR. Separate mask must be used, but it incorporates the same outer mask (seal). Separate masks, even though identical, are required for use on SCBA and APR.

Interoperability with Equipment: Head lamps; active communication equipment

Heads up Display: The HUD is mounted inside the facemask on the outside of the nosecup and is a wireless design. Eight (8) AA batteries are in the backframe and supply the entire SCBA and not just the HUD. Battery life depends on the number of other electronic features added to the SCBA. HUD is compliant to NFPA 1981, 2002 edition.

Battery Requirements: HUD, voice amplification, backframe indicator lights—1 battery pack for all functions made up of 8 AA alkaline batteries—depends on the number of features on the SCBA

Indicator Alarms: Combination of visible (HUD Display), audible (bell alarm), or vibratory alarm for low cylinder pressure. Performance of the indicators has been tested under cold conditions [-30 °C (-22 °F)].

HUMAN FACTORS

Communication: Built-in CBRN approved voice amplifier; speech intelligibility testing has been performed using NIOSH's test method with overall performance rating of 80 %

Sizes Available: Small, medium, and large

Don/Dooff Information: No assistance needed; 0 s to 30 s to don or doff

Comfort/Weight: Model 300012—5.44 kg (12 lb)

Cylinder—4.88 kg (10.75 lb)

Facemask—0.703 kg (1.55 lb)

Weight as worn—11.02 kg (24.3 lb)

Model 300013—5.44 kg (12 lb)

Cylinder—6.43 kg (14.18 lb)

Facemask—0.703 kg (1.55 lb)

Weight as worn—12.58 kg (27.73 lb)

Model 300014—5.44 kg (12 lb)

Cylinder—8.48 kg (18.7 lb)
Facemask—0.703 kg (1.55 lb)
Weight as worn—14.63 kg (32.25 lb)
Model 300011—5.44 kg (12 lb)
Cylinder—4.81 kg (10.6 lb)
Facemask—0.703 kg (1.55 lb)
Weight as worn—10.95 kg (24.15 lb)

Training Requirements: <8 h; user training is usually done by ISI authorized distributors; SCBA respiratory protection program is user and distributor responsibility; respirator requires fit-testing; certified in NFPA training procedure

Training Available: User training, low level maintenance training, and high level maintenance training are available. Customized training is provided (as an additional cost or included as part of the sale). User training is usually part of the sale. Recertification training and maintenance training can include a cost.

Manuals: Manual and video tape available for donning/doffing

LOGISTICS

Maintenance Required: General surveillance required before and after each use; routine maintenance annually

Maintenance/Technical Support: Maintenance manual only available after attending maintenance class

24 h tech support available—call 888-ISI-SAFE and leave message in emergency mailbox for automatic paging. Field maintenance available (service centers are available in the U.S. and Canada).

Maintenance Cost: No recommended expense except for annual flow testing. No required parts; replace parts as needed.

Use/Reuse: Equipment can be cleaned and reused with minimal effort—unless exposed to CBRN atmosphere; then it must be discarded; make sure cylinder is full, activate cylinder to automatically turn on unit for checking electronics and air flow.

Comprehensive equipment performance inspection recommended (daily, weekly or monthly checks) depending on the amount of use of the product. Decontamination and/or disposal procedures are available, ISI recommends following standard OSHA procedures.

Shelf Life: Normal life of an SCBA is 10 yr to 15 yr. These units normally do not sit on a shelf but are used on a daily or weekly basis. If stored, the storage conditions would play a big part in the life of the product. Air needs to be drained out of the cylinder 1 time per year if not used and replaced with new air.

Storage Conditions: Store in non UV environment in 4 °C to 27 °C (40 °F to 80 °F). Factors that decrease shelf life: UV, long-term excessive heat/cold, and dirty environment.

Package Shape/Volume: Rigid (cardboard). Choice of plastic hardcase [approximately 84 cm x 36 cm x 28 cm (33 in x 14 in x 11 in)] or cardboard box [approx 71 cm x 30 cm x 43 cm (28 in x 12 in x 17 in)].

Color: No custom colors

Health Hazards and Safety: No latex or other allergens

MSDS: MSDS for compressed air

Warranty: Lifetime, except electronic components are warranted for 1 yr. See ISI warranty statement for details.

GENERAL

ISI Viking ST

Model: ST

International Safety Instruments
 922 Hurricane Shoals Road
 Lawrenceville, Georgia 30043
 Mark Williamson
 888-ISI-SAFE (Tel)
 770-963-2797 (Fax)
 markw@intsafety.com

Information Source: <http://www.intsafety.com>

Vendor Status: The vendor has responded

Availability: Manufactured on demand; 4 wk lead time;
 each order must be \$100 or more



NIOSH Status: NFPA 1981 (2002 Edition)

NIOSH CBRN Number(s):

NFPA 1981 (2002 Edition) for police service

Certification Date:

7/18/2005

Breathing Air Cycle (PSIG):

- 4500 psig
- 2216 psig

Duration Rating:

- 30 min
- 45 min
- 60 min

Unit Cost: Voice Amplification—No charge

Radio Interface Option—\$278

Buddy Breathing—\$220

Spectacle Kit—\$71 (list pPrice)

Airline, Hansen HK Fittings—\$247

Airline, CEJN Fittings—\$247

SCBA Carrying Case—\$108

Radion Interface Cables—depends on radio type and model

Other Certifications: SEI—NFPA 1981(2002)—Viking SCBA, July 18, 2005, SBA-ISI-03; UL913

Configuration Tested: See assembly matrix (Part number 084085—Viking CBRN SCBA NIOSH Approval Information Sheet)

Related Ensembles: Kappler Zytron™ 500 Z5HTN NFPA 1994 Class 1 Certified Ensemble

Tychem® Responder NFPA 1994 Class 1 Fully Encapsulated Level A Suit

Tychem® Responder® NFPA 1991 Fully Encapsulated Level A Ensembles

Tychem® TK Fully Encapsulated Level A suit (TK612T)

Tychem® TK Fully Encapsulated Level A suit (TK613T)

PAPR Description: Viking ST SCBA is designed for law enforcers with its all black design and “Stealth” mode to turn off the lights and voice amplifier until you need them. The unit incorporates the AirSwitch facemask and regulator, easy donning harness, heads-up display for low air and built in communications. Bell is required on CBRN version because of NFPA. Radio interface is an option on the unit and the Voice Amplification comes standard at no additional charge.

PAPR Application: Flammable environment, fused munitions, explosive atmospheres, IDLH environments or atmosphere with less than 19.5 % oxygen concentration, radiation, biological, deep frozen media, and other

Cylinder Options: No details

EOD Capability: The Viking ST has been tested by Med-Eng with the SRS-5 Helmet and it is the only SCBA that had an overall rating to use

References: Riverside County, CA Sheriffs—37 units—1 yr—Ron Berry (951-922-7660)

Los Angeles Airport—9 units—1 yr—Sgt. Robert Rios (310-646-5252)

Seminole County Sheriffs—34 units—2 yr—Ed Allen (407-665-6600)

Valparaiso, IN fire Dept.—35 units—1 yr—Chief Steindler (219-462-8325)

Great Falls, MT Fire Dept.—40 units—1 yr—Jim Hirost (406-727-0870)

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: CA, BA, TIC/TIM, and radiological

Protection factor: LRPL testing performed at U.S. Army's Protection Factor Test Facility. An overall 97.37 % passing percentage was attained; individual reports not received; and 95 % of the test subjects exceed an LRPL of 500.

DESIGN/CONFIGURATION

Visor: Visor contains coatings (anti-scratch on the outside and anti-fog on the inside); spectacle kit is available (adjusts vertically and horizontally); rigid polycarbonate visor; visor is a double curved sphere which is optically correct

Field of View: 90 % to 100 %. Field of view is different for each individual, depends on face size and facial features. Visual acuity meets eye test performance criterion.

Facepiece Compatibility: NIOSH certified for use with an APR. Separate mask must be used, but it incorporates the same outer mask (seal). Separate masks, even though identical, are required for use on SCBA and APR.

Interoperability with Equipment: Head lamps; active communication equipment

Heads up Display: The HUD is mounted inside the facemask on the outside of the nose cup and is a wireless design. Eight (8) AA batteries are in the backframe and supply the entire SCBA and not just the HUD. Battery life depends on the number of other electronic features added to the SCBA. HUD is compliant to NFPA 1981, 2002 edition.

Battery Requirements: HUD, voice amplification, backframe indicator lights—1 battery pack for all functions made up of 8 AA alkaline batteries—depends on the number of features on the SCBA

Indicator Alarms: Combination of visible (HUD Display) inside facemask, audible (bell alarm) inside backframe, or vibratory alarm for low cylinder pressure. Performance of the indicators has been tested under cold conditions [-30 °C (-22 °F)].

HUMAN FACTORS

Communication: Built-in CBRN approved voice amplifier; speech intelligibility testing has been performed using NIOSH's test method with overall performance rating of 80 %

Sizes Available: Small, medium, and large

Don/Doff Information: No assistance needed; 0 s to 30 s to don or doff

Comfort/Weight: Model 300011—5.44 kg (12 lb)

Cylinder—4.81 kg (10.6 lb)

Facemask—0.703 kg (1.55 lb)

Weight as worn—10.95 kg (24.15 lb)

Training Requirements: <8 h; user training is usually done by ISI authorized distributors; SCBA respiratory protection program is user and distributor responsibility; respirator requires fit-testing; certified in NFPA training procedure

Training Available: User training, low level maintenance training, and high level maintenance training are available. Customized training is provided (as an additional cost or included as part of the sale). User training is usually part of the sale. Recertification training and maintenance training can include a cost.

Manuals: Manual and video tape available for donning/doffing

LOGISTICS

Maintenance Required: General surveillance required before and after each use; routine maintenance annually

Maintenance/Technical Support: Maintenance manual only available after attending maintenance class
24 h tech support available—call 888-ISI-SAFE and leave message in emergency mailbox for automatic paging. Field maintenance available—service centers are available in the U.S. and Canada.

Maintenance Cost: No recommended expense except for annual flow testing. No required parts; replace parts as needed.

Use/Reuse: Equipment can be cleaned and reused with minimal effort—unless exposed to CBRN atmosphere; then it must be discarded; make sure cylinder is full, activate cylinder to automatically turn on unit for checking electronics and air flow. Comprehensive equipment performance inspection recommended (daily, weekly or monthly checks) depending on the amount of use of the product. Decontamination and/or disposal procedures are available, ISI recommends following standard OSHA procedures.

Shelf Life: Normal life of an SCBA is 10 yr to 15 yr. These units normally do not sit on a shelf but are used on a daily or weekly basis. If stored, the storage conditions would play a big part in the life of the product. Air needs to be drained out of the cylinder 1 time per year if not used and replaced with new air.

Storage Conditions: Store in non UV environment in 4 °C to 27 °C (40 °F to 80 °F). Factors that decrease shelf life: UV, long-term excessive heat/cold, and dirty environment.

Package Shape/Volume: Rigid (cardboard). Choice of plastic hardcase [approximately 84 cm x 36 cm x 28 cm (33 in x 14 in x 11 in)] or cardboard box [approx 71 cm x 30 cm x 43 cm (28 in x 12 in x 17 in)].

Color: No custom colors

Health Hazards and Safety: No latex or other allergens

MSDS: MSDS for compressed air

Warranty: Lifetime, except electronic components are warranted for 1 yr. See ISI warranty statement for details.

GENERAL

Interspiro Spiromatic**Model:** Spiromatic-S4 4530, 6630, and 9030

Interspiro
31 Business Park Drive
Branford, Connecticut 06405
Interspiro Group
500 E. Main St.
Branford, CT. 06405
800-468-7788 (Tel)
203-481-3899 (Tel)
203-483-1879 (Fax)

Information Source: Responder Knowledge Database
<http://www.interspiro-us.com/>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnapproved/scba/default.html#list>

Vendor Status: The vendor has not responded



NIOSH Status: NFPA 1981 (2002 Edition)

NIOSH CBRN Number(s):

TC-13F-133CBRN (4500 psig, 30 min)
TC-13F-213CBRN (4500 psig, 45 min)
TC-13F-197CBRN (4500 psig, 60 min)

Certification Date:

5/31/2002

Breathing Air Cycle (PSIG):

■4500 psig

Duration Rating:

■30 min
■45 min
■60 min

Unit Cost: Not specified

Other Certifications: Certified Intrinsically Safe: UL 913, for use in Class 1, Division 1, Group A, B, C, and D. Meets all current NFPA specifications, NFPA 1981, 1997 Edition, and complies with the EOST requirement of 9/1/99.

Configuration Tested: Configuration tested: Custom 4500 MMR Xtreme CBRN Air Mask with FireHawk regulator

Related Ensembles: STEPO—Self Contained Toxic Environment Protective Outfit (NSN 8415-01-054-1627)

Kappler Zytron™ 500 Z5HTN NFPA 1994 Class 1 Certified Ensemble

STEPO—Self Contained Toxic Environment Protective Outfit (NSN 8415-01-054-1627)

PAPR Description: SPIROMATIC S4 is the fourth generation SCBA of NIOSH/NFPA approved Spiromatic-S. Spiromatic-S is a major upgrade and enhancement to the popular and durable Spiromatic model. The Spiromatic S4 is equipped with a Heads-Up-Display (HUD), Breathing Apparatus Computer (BAC), and Rapid Intervention Connection (RIC). It also features a pivoting harness back plate, buddy breathing hose, dual redundant End-Of-Service-Time (EOST) indicator, and integrated PASS. Features include “All-hazards” protection: fire, hazmat, WMD, and chem/bio terror threats; rugged design, simple to operate and maintain; low life cycle cost; simple maintenance and operation; integrated ambient air hatch providing fresh air without removing the breathing valve; heavily padded harness with wide shoulder straps featuring wrap around Velcro to secure hoses and allow the regulator to be removed. Additional features include: Integrated Personal Alert Safety System (PASS); Heads Up Display (HUD): display on the left side of the mask indicating remaining cylinder pressure with a low air alarm; Breathing Apparatus Computer (BAC): black box mounted on the SCBA back frame that monitors cylinder pressure and other data, and then sends that information to the HUD; Rapid Intervention Connection (RIC): the RIC (or UAC, Universal Air Connection) allows for rapid refilling of cylinders during emergency conditions; and integrated ambient air hatch providing fresh air without removing the breathing valve.

PAPR Application: Not specified

Cylinder Options: Not specified

EOD Capability: Not specified

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: CA, BA, TIC/TIM, and radiological

Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Spectacle kit is available

Field of View: Not specified

Facepiece Compatibility: Face mask can only be used with an SCBA because face mask and breathing valve are integrated

Interoperability with Equipment: Active communication equipment—Savox 500 or 400 Radio Interface

Heads up Display: LED-based display along the left side of the mask lens gives hands-free indication of remaining cylinder pressure and a visual low air alarm. The mask frame mounted HUD continues the Interspiro modular design approach, i.e., the HUD operates independently of the second stage breathing valve resulting in lower maintenance costs. The HUD electrical connector is connected/disconnected and locked along with the breathing hose quick disconnect. This makes the HUD/by-pass quick connect a combination electrical/pneumatic quick connector. The HUD/by-pass quick connect enables personal masks with breathing valve and by-pass to also be equipped with a personal HUD.

Battery Requirements: The black box mounted on the SCBA backframe monitors the cylinder pressure and other data and then sends that information to the HUD. The BAC is powered by a standard 9 V battery.

Indicator Alarms: Spiromatic is equipped with dual redundant low air warning End of Service Time (EOST) indicators (audible and visual). The primary low air alarm (EOST) is an audible whistle. The secondary alarm (EOST) is a visual flashing red LED on the pressure gauge.

HUMAN FACTORS

Communication: The Voice Projection Unit Kit 96918–01 consists of a Voice Projection Unit 94492–01 and VPU Outer Speech Cone 96493–0. The VPU can only be used on an S mask with a VPU outer speech cone first installed in the place of the standard outer speech cone.

Sizes Available: Masks available in small, medium, large, and extra large; considered the most comfortable on the market

Don/Dooff Information: Not specified

Comfort/Weight: Total weight: 7.2 kg; see online catalog

Training Requirements: Not specified

Training Available: Not specified

Manuals: Not specified

LOGISTICS

Maintenance Required: Breathing apparatus from Interspiro is an investment with a long service life when properly maintained. To simplify service and to obtain maximum product performance we recommend using our service kits, containing original spare parts necessary for preventive maintenance. Interspiro offers training courses for users who perform day-to-day service work, as well as training for service personnel performing full maintenance programs.

Maintenance/Technical Support: Not specified

Maintenance Cost: Not specified

Use/Reuse: Not specified

Shelf Life: Not specified

Storage Conditions: Not specified

Package Shape/Volume: Not specified

Color: Not specified

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: Interspiro warrants this product against failure to comply with Interspiro's published specifications for the product and against defects in materials and workmanship for a period of 12 mo after date of purchase. Within that period, Interspiro will, at its option, repair or replace the product or refund your purchase price if Interspiro determines the product does not conform to Interspiro's specifications or is defective in material or workmanship. See online user's manual for further details.

GENERAL

Interspiro Spirotek

Model: Spirotek-T4 4530, 6630, and 9030

Interspiro
31 Business Park Drive
Branford, Connecticut 06405
Interspiro Group
500 E. Main St.
Branford, CT. 06405
800-468-7788 (Tel)
203-481-3899 (Tel)
203-483-1879 (Fax)

Information Source: Responder Knowledge Database
<http://www.interspiro-us.com/>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnapproved/scba/default.html#list>

Vendor Status: The vendor has not responded



NIOSH Status: NFPA 1981 (2002 Edition)

NIOSH CBRN Number(s):

TC-13F-375CBRN (4500 psig, 30 min)
TC-13F-420CBRN (4500 psig, 45 min)
TC-13F-421CBRN (4500 psig, 60 min)

Certification Date:

10/24/2003

Breathing Air Cycle (PSIG):

■4500 psig

Duration Rating:

■30 min
■45 min
■60 min

Unit Cost: Not specified

Other Certifications: Not specified

Configuration Tested: Not specified

Related Ensembles: Not specified

PAPR Description: The Spirotek T4 is equipped with a supplied air coupling that is conveniently placed on the right shoulder strap in order to make connection and disconnection of air line hoses and accessories easy for the user. Features include "All-hazards" protection: fire, hazmat, WMD, and chem/bio terror threats; rugged design, simple to operate and maintain; low life cycle cost; simple maintenance and operation; integrated ambient air hatch providing fresh air without removing the breathing valve; and sidearm waist belt harness with wide shoulder straps featuring wrap around Velcro to secure hoses and allow the regulator to be removed. Additional features include Heads Up Display (HUD): display on the left side of the mask indicating remaining cylinder pressure with a low air alarm; Breathing Apparatus Computer (BAC): black box mounted on the SCBA back frame that monitors cylinder pressure and other data, and then sends that information to the HUD; Rapid Intervention Connection (RIC): the RIC (or UAC, Universal Air Connection) allows for rapid refilling of cylinders during emergency conditions; Integrated Personal Alert Safety System (PASS); and Integrated ambient air hatch providing fresh air without removing the breathing valve.

PAPR Application: Not specified

Cylinder Options: Not specified

EOD Capability: Not specified

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: Not specified

Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Spectacle kit is available

Field of View: Not specified

Facepiece Compatibility: Face mask and breathing valve are integrated so therefore could only be used with an SCBA

Interoperability with Equipment: Active communication equipment—Savox 500 or 400 Radio Interface

Heads up Display: LED-based display along the left side of the mask lens gives hands-free indication of remaining cylinder pressure and a visual low air alarm. The mask frame mounted HUD continues the Interspiro modular design approach, i.e., the HUD operates independently of the second stage breathing valve resulting in lower maintenance costs. The HUD electrical connector is connected/disconnected and locked along with the breathing hose quick disconnect. This makes the HUD/by-pass quick connect a combination electrical/pneumatic quick connector. The HUD/by-pass quick connect enables personal masks with breathing valve and by-pass to also be equipped with a personal HUD.

Battery Requirements: The black box mounted on the SCBA backframe monitors the cylinder pressure and other data and then sends that information to the HUD. The BAC is powered by a standard 9 V battery.

Indicator Alarms: Spirotek is equipped with dual redundant low air warning End of Service Time (EOST) indicators (audible and visual). The primary low air alarm (EOST) is an audible whistle. The secondary alarm (EOST) is a visual flashing red LED on the pressure gauge.

HUMAN FACTORS

Communication: The Voice Projection Unit Kit 96918–01 consists of a Voice Projection Unit 94492–01 and VPU Outer Speech Cone 96493–0. The VPU can only be used on an S mask with a VPU outer speech cone first installed in the place of the standard outer speech cone.

Sizes Available: Masks available in small, medium, large, and extra large; considered the most comfortable on the market

Don/Dooff Information: Not specified

Comfort/Weight: Spirotek 4 HP—5.58 kg (12.3 lb)

Training Requirements: Not specified

Training Available: Not specified

Manuals: Not specified

LOGISTICS

Maintenance Required: Not specified

Maintenance/Technical Support: Not specified

Maintenance Cost: Not specified

Use/Reuse: Not specified

Shelf Life: Not specified

Storage Conditions: Not specified

Package Shape/Volume: Not specified

Color: Not specified

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: Interspiro warrants this product against failure to comply with Interspiro's published specifications for the product and against defects in materials and workmanship for a period of 12 mo after date of purchase. Within that period, Interspiro will, at its option, repair or replace the product or refund your purchase price if Interspiro determines the product does not conform to Interspiro's specifications or is defective in material or workmanship. See online user's manual for further details.

GENERAL

MSA Custom 4500 MMR Xtreme CBRN Air Mask with FireHawk Regulator**Model:** Various models—assemble to order

Mine Safety Appliances Company
 PO Box 426
 Pittsburgh, Pennsylvania 15230-0426
 Evan K. Erickson
 800-251-9383, ext. 274 (Tel)
 724-733-8573 (Fax)
 evan.erickson@msanet.com

Information Source: Responder Knowledge Database
<http://www.msanet.com>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnapproved/scba/default.html#list>

Vendor Status: The vendor has responded**Availability:** Manufactured on demand; 2 wk to 4 wk lead time; minimum order of 1 SCBA**NIOSH Status:** NFPA 1981 (2002 Edition)**NIOSH CBRN Number(s):**

TC-13F-526CBRN (3000 psig, 30 min)
 TC-13F-474CBRN (4500 psig, 60 min)
 TC-13F-475CBRN (4500 psig, 30 min)
 TC-13F-476CBRN (4500 psig, 45 min)

Certification Date:

Not specified

Breathing Air Cycle (PSIG):

- 3000 psig
- 4500 psig

Duration Rating:

- 30 min
- 45 min
- 60 min

Unit Cost: List price is typically around \$5K. GSA contract price is around \$3K.**Other Certifications:**

- SEI—NFPA 1981 (2002 Ed) MSA MMR SCBA Misc. Hose Kits, August 4, 2004, SBA-MSA-04-Accessory12
 SEI—NFPA 1981 (2002 Ed) MSA MMR SCBA Quick Connect Hose Washer, July 1, 2003, SBA-MSA-04-Accessory12
 SEI—NFPA 1981 (2002 Ed) MMR Custom 4500 Air Mask SCBA, 8/29/2002
 SEI—NFPA 1981 (2002 Ed) MSA 1st Stage Regulators, September 23, 2004, SBA-MSA-04-Variant01
 SEI—NFPA 1981 (2002 Ed) MSA 1st Stage Regulators for MMR SCBA Quick Connect Hose Washer, September 23, 2004, SBA-MSA-04-Variant01

Configuration Tested: Configuration tested:

- 10011767—Lumbar Support Assembly
 10012167—Chest Strap kit
 10018621—Adapter, slide, FireHawk
 10023638—Users Instructions, MMR Air Mask
 10024151—Carrier and Harness Assembly, NFPA, MMR, with Slide Belt mount, HP
 10027085—Vulcan sliding regulator kit
 10032439—Manifold assy, dual QC, Extend-Aire FireHawk
 10035580—Users Instructions NightFighter
 10038034—1st Stage Regulator & Audi 4500 Quick Connect with RIC valve
 10043893—2nd Stage Regulator Firehawk Quick Connect, Slide
 10044165—Users Instructions, Donning for CBRN use
 7-1219-1—Gauge & Hose Assy., Custom 4500
 7-1537-1—Cylinder & Valve Assy. 88 scf 4500 carbon
 7-935-7—Ultra Elite, medium NFPA
 7-935—Ultra Elite, small, NFPA
 7-935-9 Ultra Elite, large, NFPA
 804638—Spectacle Kit, Ultra Elite

817394—Waist Belt Extender, NFPA

Related Ensembles: Kappler Zytron™ 500 Z5HTN NFPA 1994 Class 1 Certified Ensemble

DuPont Tychem® Responder NFPA 1994 Class 1 Fully Encapsulated Level A Suit

DuPont Tychem® Responder® NFPA 1991 Fully Encapsulated Level A Ensembles

DuPont Tychem® TK Fully Encapsulated Level A suit (TK612T)

DuPont Tychem® TK Fully Encapsulated Level A suit (TK613T)

PAPR Description: MSA offers multiple SCBA with CBRN approval. Three cylinder pressures are available. Airline and emergency breathing systems are optional. Facepieces are available in three sizes; two head harnesses. Sleek, rugged and lightweight, the MMR Xtreme Air Mask is the future of self-contained breathing apparatus (SCBA). It has the best of everything—from its comfortable, wide vision Ultra Elite® facepiece and clean, low profile mask mounted regulator with large shutoff button, to its high strength yet remarkably lightweight cylinder options and advanced Black Rhino or Vulcan carrier/harness assembly. MMR Extreme Air Masks are the superior options available on the Ultralite and Custom 4500 MMR Air Masks.

PAPR Application: Flammable environment; fused munitions—with proper suits; IDLH environments or atmosphere with less than 19.5 % oxygen concentration; radiation—with proper clothing; biological; and deep frozen media

Cylinder Options: Stealth™ Cylinders are the lightest SCBA air cylinders ever developed by MSA. They feature a unique outer wrap made of lightweight, high performance carbon fibers, which reduce cylinder weight by 2 lb to 6 lb when compared to fiberglass wrapped cylinders and as much as 10 lb when compared to aluminum cylinders. They are available in five models to accommodate a wide range of applications

Fiberglass Fully-Wound Composite Cylinders—color coded to differentiate cylinder pressure

Fiberglass Hoop-Wound Composite Cylinder—30 min low pressure cylinder

3AL Cylinder—30 min low pressure cylinder

EOD Capability: Yes

References: Various U.S. Cities

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: CA, BA, TIC/TIM, and radiological

Protection factor: LRPL testing performed at U.S. Army's Protection Factor Test Facility. 95 % of test subjects exceeded 5000, and 95 % of the test subjects exceed an LRPL of 500.

DESIGN/CONFIGURATION

Visor: Visor contains coatings to enhance scratch resistance and reduce fogging; spectacle kit is available; rigid polycarbonate visor with a hard coat

Field of View: 92 %—FOV. Visual acuity meets eye test performance criterion.

Facepiece Compatibility: Compatible with APR and PAPR (MSA Ultra Elite); same mask can be used for multiple platforms

Interoperability with Equipment: Head lamps are connected to headwear; active communication equipment

Heads up Display: MSA's HUD is mounted on the outside of the facepiece

Battery Requirements: HUD—COTS—AAA—100 h use/24 h continuous

Integrated control module—COTS—9 V—50 h

Communications—COTS—AAA—15 h

Indicator Alarms: Combination of visible, audible, or vibratory alarm for low cylinder pressure; bell on SCBA frame, heads up display, pressure gauges on cylinder and integrated control module. Performance of the indicators has been tested under cold conditions [-30 °C (-22 °F)].

HUMAN FACTORS

Communication: CBRN approved voice amplifier; speech intelligibility testing has been performed using NIOSH's test method

Sizes Available: Small, medium, and large

Don/Dooff Information: No assistance needed; 31 s to 60 s to don; 0 s to 30 s to doff

Comfort/Weight: Total weight: 9.5 kg. Weight varies depending on configuration; all are less than NFPA and NIOSH limits

Training Requirements: <8 h provided by manufacturer; respirator requires fit-testing; certified in NFPA training procedure

Training Available: Video training and MSA sales rep training; customized training is available (minimum order required). Customized training is customer dependent.

Manuals: Manual

LOGISTICS

Maintenance Required: General surveillance required before and after each use; routine maintenance depends on usage

Maintenance/Technical Support: Maintenance manual; 24 h tech support available—Call MSA Technical Support at 800-672-2222. MSA offers factory repairs; distributors offer field repairs.

Maintenance Cost: < \$7 per day for busy users (cylinder refills every other day)

Use/Reuse: Equipment can be cleaned and reused with minimal effort; functional checks and visual inspections are recommended; comprehensive equipment performance inspection recommended; decontamination procedures are available; disposal is the responsibility of the owner

Shelf Life: Greater than or equal to 15 yr; requires nothing more than normal storage conditions

Storage Conditions: Warehouse conditions

Package Shape/Volume: Soft sided duffle bag (with or without straps); rigid (metal or plastic) 61 cm x 46 cm x 24 cm (24 in x 18 in x 10 in)

Color: No custom colors; black facepiece only, although cylinders can be silk-screened with specific markings

Health Hazards and Safety: Equipment contains latex; facepiece has natural rubber in its blend (trace levels on latex emulsions); no other allergens

MSDS: MSDS is available

Warranty: Lifetime warranty on regulator; 18 mo on apparatus

GENERAL

MSA Ultralite MMR Xtreme CBRN Air Mask with FireHawk Regulator**Model:** Various models—assemble to order

Mine Safety Appliances Company
 PO Box 426
 Pittsburgh, Pennsylvania 15230-0426
 Evan K. Erickson
 800-251-9383, ext. 274 (Tel)
 724-733-8573 (Fax)
 evan.erickson@msanet.com

Information Source: Responder Knowledge Database
<http://www.msanet.com>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnapproved/scba/default.html#list>

Vendor Status: The vendor has responded**Availability:** Manufactured on demand; 2 wk to 4 wk lead time; minimum order of 1 SCBA**NIOSH Status:** NFPA 1981 (2002 Edition)**NIOSH CBRN Number(s):**

TC-13F-473CBRN (2216 psig, 30 min)

Certification Date:

Not specified

Breathing Air Cycle (PSIG):

- 2216 psig
- 3000 psig
- 4500 psig

Duration Rating:

■30 min

Unit Cost: List price is typically around \$5K. GSA contract price is around \$3K.**Other Certifications:** Not specified

Configuration Tested: SCBA are ordered as custom products through MSA's ATO matrix (Assemble-To-Order). MSA pursued and received CBRN approvals for the latest and most popular SCBA components. These include the Vulcan and Black Rhino Carrier/Harness assemblies and the Ultra Elite facepiece with 4-point adjustable Speed-ON Head harness. If you have a rubber or 5-point Speed-ON head harness, facepieces can easily be upgraded to the most current 4-point style.

Related Ensembles: No third party certification

PAPR Description: MSA offers multiple SCBA with CBRN approval. Three cylinder pressures are available. Airline and emergency breathing systems are optional. Facepieces are available in three sizes; two head harnesses. With MSA MMR Air Masks, performance is enhanced by a unique split regulator design. The regulator's first stage is located on the cylinder backplate, while the second stage attaches to the user's facepiece. The low pressure Ultralite MMR Air Mask can be used with cylinders pressurized to either 2216 psig or 3000 psig. The Custom 4500 MMR Air Mask is used with 4500 psig cylinders. All MMR units can be easily upgraded to include the Quick-Fill option for emergency breathing system, plus fast, convenient refilling of air cylinders.

PAPR Application: Flammable environment; fused munitions—with proper suits; IDLH environments or atmosphere with less than 19.5 % oxygen concentration; radiation—with proper clothing; biological; and deep frozen media

Cylinder Options: Stealth™ Cylinders are the lightest SCBA air cylinders developed by MSA. They feature a unique outer wrap made of lightweight, high performance carbon fibers, which reduce cylinder weight by 2 lb to 6 lb when compared to fiberglass wrapped cylinders and as much as 10 lb when compared to aluminum cylinders. They are available in five models to accommodate a wide range of applications

Fiberglass Fully-Wound Composite Cylinders—color coded to differentiate cylinder pressure

Fiberglass Hoop-Wound Composite Cylinder—30 min low pressure cylinder

3AL Cylinder—30 min low pressure cylinder

EOD Capability: Yes**References:** Various U.S. Cities

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: CA, BA, TIC/TIM, and radiological

Protection factor: LRPL testing performed at U.S. Army's Protection Factor Test Facility. 95 % of test subjects exceeded 5000, and 95 % of the test subjects exceed an LRPL of 500.

DESIGN/CONFIGURATION

Visor: Visor contains coatings to enhance scratch resistance and reduce fogging; spectacle kit is available; rigid polycarbonate visor with a hard coat

Field of View: 92 %—FOV. Visual acuity meets eye test performance criterion.

Facepiece Compatibility: Compatible with APR and PAPR (MSA Ultra Elite); same mask can be used for multiple platforms

Interoperability with Equipment: Head lamps are connected to headwear; active communication equipment

Heads up Display: MSA's HUD is mounted on the outside of the facepiece

Battery Requirements: HUD—COTS—AAA—100 h use/24 h continuous

Integrated control module—COTS—9 V—50 h

Communications—COTS—AAA—15 h

Indicator Alarms: Combination of visible, audible, or vibratory alarm for low cylinder pressure; bell on SCBA frame, heads up display, pressure gauges on cylinder and integrated control module. Performance of the indicators has been tested under cold conditions [-30 °C (-22 °F)].

HUMAN FACTORS

Communication: CBRN approved voice amplifier; speech intelligibility testing has been performed using NIOSH's test method

Sizes Available: Small, medium, and large

Don/DoFF Information: No assistance needed; 31 s to 60 s to don; 0 s to 30 s to doff

Comfort/Weight: Total weight: 9.5 kg. Weight varies depending on configuration; all are less than NFPA and NIOSH limits.

Training Requirements: <8 h provided by manufacturer; respirator requires fit-testing; certified in NFPA training procedure

Training Available: Video training and MSA sales rep training; customized training is available (minimum order required).

Customized training is customer dependent.

Manuals: Manual

LOGISTICS

Maintenance Required: General surveillance required before and after each use; routine maintenance depends on usage

Maintenance/Technical Support: Maintenance manual; 24 h tech support available—Call MSA Technical Support at 800-672-2222. MSA offers factory repairs; distributors offer field repairs.

Maintenance Cost: < \$7 per day for busy users (cylinder refills every other day)

Use/Reuse: Equipment can be cleaned and reused with minimal effort; functional checks and visual inspections are recommended; comprehensive equipment performance inspection recommended; decontamination procedures are available; disposal is the responsibility of the owner

Shelf Life: Greater than or equal to 15 yr; requires nothing more than normal storage conditions

Storage Conditions: Warehouse conditions

Package Shape/Volume: Soft sided duffle bag (with or without straps); rigid (metal or plastic) 61 cm x 46 cm x 24 cm (24 in x 18 in x 10 in)

Color: No custom colors; black facepiece only, although cylinders can be silk-screened with specific markings

Health Hazards and Safety: Equipment contains latex; facepiece has natural rubber in its blend (trace levels on latex emulsions); no other allergens

MSDS: MSDS is available

Warranty: Lifetime warranty on regulator; 18 mo on apparatus

GENERAL

Scott Scott Air-Pak®**Model:** Air-Pack 2.2, Air-Pack 3.0, and Air-Pack 4.5

Scott Health and Safety
4320 Goldmine Road
Monroe, North Carolina 28110
Greg Gatlin
704-291-8407 (Tel)
704-291-8420 (Fax)
ggatlin@tycoint.com

Information Source: Responder Knowledge Database
<http://www.scotthealthsafety.com>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnapproved/scba/default.html#list>

Vendor Status: The vendor has not responded



NIOSH Status: NFPA 1981 (2002 Edition)

NIOSH CBRN Number(s):

TC-13F-80CBRN (2216 psig, 30 min)
TC-13F-366CBRN (3000 psig, 30 min)
TC-13F-76CBRN (4500 psig, 30 min)
TC-13F-212CBRN (4500 psig, 45 min)
TC-13F-96CBRN (4500 psig, 60 min)

Certification Date:

2/27/2004

Breathing Air Cycle (PSIG):

- 2216 psig
- 3000 psig
- 4500 psig

Duration Rating:

- 30 min
- 45 min
- 60 min

Unit Cost: Not specified

Other Certifications: ETL listed for Intrinsic Safety Class I, II, III, Div. I, Groups A, B, C, D, E, F, and G per ANSI/UL 913

SEI—NFPA 1981 (2002 Ed.)—Scott Air-Pak, July 12, 2005, SBA-SCT-03

SEI—NFPA 1981 (2002 Ed.)—Scott Health & Safety—AirPak 2.2/3.0/4.5 SCBA Models (Facemasks), July 21, 2004, SBA-SCT-03-Variant03

SEI—NFPA 1981 (2002) and NFPA 1982 (1998)—Scott PASS Portion: PAK Alert SE+, Scott Health and Safety
PASS Portion: PAK Alert SE+ model number 805179-02 for use with Scott Air-Pak® models 2.2/3.0/4.5

SEI—NFPA 1981 (2002) and NFPA 1982 (1998)—Scott PASS Portion: PAK Alert SE+, Scott Health and Safety
PASS Portion: PAK Alert SE+ model number 805796-01 for use with Scott Air-Pak® models 2.2/3.0/4.5

Configuration Tested: Air-Pak® Fifty™ 2.2 SCBA

AV-2000® Facepiece

AV-3000™ Facepiece

Related Ensembles: Kappler Zytron™ 500 Z5HTN NFPA 1994 Class 1 Certified Ensemble

Lion Tactix MT-94: Multi-threat protection in a multi wear garment

DuPont Tychem® Responder NFPA 1994 Class 1 Fully Encapsulated Level A Suit

DuPont Tychem® Responder® NFPA 1991 Fully Encapsulated Level A Ensembles

DuPont Tychem® TK Fully Encapsulated Level A suit (TK612T)

DuPont Tychem® TK Fully Encapsulated Level A suit (TK613T)

PAPR Description: Scott Air-Pak Fifty SCBA offers: Cutting edge respiratory protection for first responders, municipal and industrial firefighters; time-tested record of reliable performance and rugged dependability; redundant safeguards promote an added margin of safety; tactile feel end of service indicator. Includes Scott's workhorse regulator, the E-Z Flo®, available in 2216 psi, 3000 psi, and 4500 psi operating pressures. Cylinder duration is available in 30 min, 45 min, and 60 min. Top down convertibility with AV-2000® facepiece. AV-2000 allows for interface with Scott's full range of communication devices. A lightweight, ergonomically designed harness system that places bulk of weight on hips instead of the shoulders. The harness

incorporates quick release take-up with parachute style hardware. Options include EBSS, Quick Connect E-Z Flo Regulator, Quick Charge, Airline pigtail, and integrated PASS.

PAPR Application: Not specified

Cylinder Options: Not specified

EOD Capability: Not specified

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: Not specified

Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Not specified

Field of View: Not specified

Facepiece Compatibility: Not specified

Interoperability with Equipment: Not specified

Heads up Display: Not specified

Battery Requirements: Greater than 8 h disposable and rechargeable (COTs and manufacturer specific)

Indicator Alarms: Not specified

HUMAN FACTORS

Communication: Not specified

Sizes Available: Not specified

Don/DoFF Information: Not specified

Comfort/Weight: Not specified

Training Requirements: Not specified

Training Available: Not specified

Manuals: Not specified

LOGISTICS

Maintenance Required: Not specified

Maintenance/Technical Support: Not specified

Maintenance Cost: Not specified

Use/Reuse: Not specified

Shelf Life: Not specified

Storage Conditions: Not specified

Package Shape/Volume: Not specified

Color: Not specified

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: The Scott Air-Pak Fifty is covered “bumper-to-bumper” for a full 8 yr, plus a full 15 yr on the pressure reducer assembly

GENERAL

Scott NxG₂TM Air-PakModel: NxG₂ Air-Pak

Scott Health and Safety
4320 Goldmine Road
Monroe, North Carolina 28110
Greg Gatlin
704-291-8407 (Tel)
704-291-8420 (Fax)
ggatlin@tycoint.com

Information Source: Responder Knowledge Database
<http://www.scotthealthsafety.com>
<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnapproved/scba/default.html#list>

Vendor Status: The vendor has not responded



NIOSH Status: NFPA 1981 (2002 Edition)

NIOSH CBRN Number(s):

TC-13F-516CBRN (2216 psig, 30 min)
TC-13F-517CBRN (4500 psig, 30 min)
TC-13F-518CBRN (4500 psig, 45 min)
TC-13F-519CBRN (4500 psig, 60 min)

Certification Date:

Not specified

Breathing Air Cycle (PSIG):

- 2216 psig
- 4500 psig

Duration Rating:

- 30 min
- 45 min
- 60 min

Unit Cost: Not specified

Other Certifications: Not specified

Configuration Tested: Not specified

Related Ensembles: Not specified

PAPR Description: Air-Pak NxG₂ SCBA next generation has all the features of the Air-Pak Fifty plus: AV3000 facepiece; E-Z Flo II regulator; HUD that integrates electronics; SNAP-CHANGE cylinder connections. Buddy-Breathing System—The NxG₂ features a combined dual EBSS/Airline hose connection option. This unique buddy breathing system allows users to maneuver up to 5 ft apart while not exposing the recipient or donor to ambient air during connection. Additionally, users can connect to an external air source allowing for extended durations in a bucket truck or hazmat situation. Our unique one-piece backframe is constructed of lightweight, durable, time-tested aluminum alloy. It follows the contour of the back and places the bulk of the SCBA's weight on the hips, where padded wrap-around wings provide comfortable support. Wide-bodied pads further distribute weight along the shoulders and hips. Harness-mounted, retro-reflective front patches enhance night-time visibility of the user.

PAPR Application: Cutting edge respiratory protection for first responders, municipal and industrial firefighters

- Time-tested record of reliable performance and rugged dependability
- Redundant safeguards promote an added margin of safety
- Tactile feel end of service indicator
- Includes Scott's new regulator, the E-Z Flo® II
- Available in 2216 psi and 4500 psi operating pressures
- Cylinder duration available in 30, min, 45 min, and 60 min
- Top down convertability with AV-3000TM facepiece
- AV-3000 allows for interface with Scott's full range of communication devices
- A lightweight, ergonomically designed harness system
- Places bulk of weight on hips instead of the shoulders
- Harness incorporates quick release take-up with parachute style hardware
- Options include Dual EBSS, Quick Connect Regulator
- Integrated PASS and SEMS

Cylinder Options: The Air-Pak® Fifty™ is available in 2216 psi, 3000 psi, or 4500 psi models. Choose from the latest in cylinder materials including carbon fiber, the lightest cylinder available, and aluminum. Cylinders are available in 30 min, 45 min, or 60 min rated durations. NxG2 provides SNAP-CHANGE™ Cylinder—Scott’s patent pending SNAP-CHANGE quick cylinder change-out eliminates the high-pressure hose and CGA coupling to make change out quick, simple and easy.

EOD Capability: Not specified

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: Not specified

Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Not specified

Field of View: Not specified

Facepiece Compatibility: Not specified

Interoperability with Equipment: Not specified

Heads up Display: Buddy system indicator lights (LEDS) and sounders are mounted on the backframe, and indicate to fellow firefighters both your PASS status and the status of available air and cylinder engagement. The indicators are green and quiet when the PASS is monitoring normal movement, but alarm when the wearer is motionless for more than 20 s.

Battery Requirements: Battery pack powers the electronics system and eliminates time-consuming battery checks and changes. Battery replacement is achieved by unsnapping the battery cover and simply slipping out the sleeve and replacing the three commonly available “C” batteries. Based on a 25 % usage rate, batteries in the NxG2 will provide a minimum 6 mo run time.

Indicator Alarms: Not specified

HUMAN FACTORS

Communication: Not specified

Sizes Available: Not specified

Don/DoFF Information: AirPak Fifty—The regulator’s quick-don mounting system has a 20 yr track record of proven performance. A positive-locking mount is assured with a quick quarter turn of the regulator that prevents it from being accidentally knocked loose. Simplicity is assured because the regulator automatically activates the flow of air with the user’s first breath. Air entering the facepiece is directed over the lens to prevent fogging.

Comfort/Weight: AirPak Fifty—Firefighting, search and rescue or entries into IDLH environments can be intense and physically demanding work. So, too, is the fight against weapons of mass destruction. That’s why Scott offers a lightweight SCBA package promoting comfort and user-friendly convenience.

Training Requirements: Not specified

Training Available: Not specified

Manuals: Not specified

LOGISTICS

Maintenance Required: Not specified

Maintenance/Technical Support: Not specified

Maintenance Cost: Not specified

Use/Reuse: Not specified

Shelf Life: Not specified

Storage Conditions: Not specified

Package Shape/Volume: Not specified

Color: Not specified

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: The Air Pak NxG2 is covered by a 3/10/15 yr warranty, one of the most comprehensive warranties in the industry. The electronics are covered for a period of 3 yr; the entire Air Pak is covered for 10 yr, facepiece-to-cylinder; the pressure reducer is covered by a 15 yr warranty. Quality assurance and service are just two of the many reasons Scott is the leader in respiratory protection. Simply put, during the warranty period, if you bought it from us, it’s covered.

GENERAL

Survivair Panther CBRN SCBA**Model:** Panther and Panther 2

Survivair (A Division of Bacou USA Safety, Inc.)

3001 South Susan Street

Santa Ana, California 92704

Ron Harris (Fire Safety Group)

800-345-8839 (Tel)

rharris@bacou-dalloz.com

Bob Hicks (Industrial Safety Group)

800-345-8839 x2352 (Tel)

bhicks@bacou-dalloz.com

Information Source: Responder Knowledge Database<http://www.survivair.com><http://www.survivair.com/contact/salesForce.asp><http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnapproved/scba/default.html#list>**Vendor Status:** The vendor has not responded**NIOSH Status:** NFPA 1981 (2002 Edition)**NIOSH CBRN Number(s):**

TC-13F-28CBRN (2216 psig, 30 min)

TC-13F-284CBRN (4500 psig, 30 min)

TC-13F-286CBRN (4500 psig, 45 min)

TC-13F-287CBRN (4500 psig, 60 min)

Certification Date:

9/21/1992

Breathing Air Cycle (PSIG):

■ 2216 psig

■ 4500 psig

Duration Rating:

■ 30 min

■ 45 min

■ 60 min

Unit Cost: Not specified**Other Certifications:** Not specified**Configuration Tested:**

- 1) SEI—NFPA 1981 (2002 Edition)—Survivair Cylinder & Valve Assemblies to use with the Panther SCBA, August 19, 2004, SBA-SRV-04-Variant06
- 2) SEI—NFPA 1981 (2002 Edition) and NFPA 1982 (1998 Edition)—Survivair COMPASS, March 19, 2004, SBA-SRV-04-Variant10
- 3) SEI—NFPA 1981 (2002 Edition)—Survivair, Panther SCBA, Accessories 9620-00 and 9620-01, March 21, 2005, SBA-SRV-04-Accessory20
- 4) SEI—NFPA 1981, NFPA 1982—Survivair Integrated PASS Devices, September 22, 2004, SBA-SRV-04/Variant 10
- 5) SEI—NFPA 1981 (2002 Edition)—Survivair Panther, March 11, 2005, SBA-SRV-04

Related Ensembles: Kappler Zytron™ 500 Z5HTN NFPA 1994 Class 1 Certified Ensemble (Z5HTN CH)

DuPont Tychem® Responder NFPA 1994 Class 1 Fully Encapsulated Level A Suit

DuPont Tychem® Responder® NFPA 1991 Fully Encapsulated Level A Ensembles

DuPont Tychem® TK Fully Encapsulated Level A suit (TK612T)

DuPont Tychem® TK Fully Encapsulated Level A suit (TK613T)

PAPR Description: Skirt made of surgical grade silicone (soft, pliable, and extremely comfortable). Exhalation valve is in facepiece (two separate paths for inhalation and exhalation, which virtually eliminates cross-contamination issues, low exhalation breathing resistance for comfortable breathing). Choice of head harness (silicone headstrap or mesh style Kevlar® Headnet™), can satisfy individual's personal preference. Flash hood anchor point molded into nozzle cover (helps keep flash hoods from migrating around the facepiece). Ergonomically designed backplate made of fiberglass-filled nylon. Comfortable cushioned shoulder and hip pads. WedgeLock™ fastening system. Easy adjustment of backpack to individual's body. Adjustable cylinder band with cam lock.

- Second stage regulator attaches to and detaches from facepiece quickly and easily
- Silicone extrusion protects pneumatic hose and electronic cable

- Optional analog pressure gauge
- Carrying handles for easy transporting
- Optional dual fitting that allows buddy breathing without regulator disconnection
- Hip pad for maximum comfort
- Regulator holder to store regulator in standby mode

PAPR Application: Not specified

Cylinder Options: Not specified

EOD Capability: Not specified

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: Not specified

Protection factor: Not specified

DESIGN/CONFIGURATION

Visor: Lens made of hard-coated polycarbonate (durable; resists scratching). Rims, nozzle cover, and Air Klic™ made of super-tough, space-age plastic (able to withstand drop of 30 ft onto concrete without breaking). Superior fit for most types of facial configurations, rugged, durable, does not soften, melt, or burn in high heat or direct flame, does not stiffen or become brittle in cold. 540 % elongation before breaking, does not react with ozone, wide range of chemical resistance.

Field of View: Not specified

Facepiece Compatibility: Not specified

Interoperability with Equipment: Many options available, such as voice amplification, radio communications, integrated PASS device, back-mounted remote alarm module for integrated PASS device, buddy breather, auxiliary coupling for rapid intervention "daisy chaining," supplied air attachment, Smokeater™ escape canister, and more

Heads up Display: LED flashes green for 50 % low air alarm. LED flashes red for 25 % low air alarm and flashes red faster for 10 % low air alarm. LEDs that indicate cylinder pressure continuously. Amber low battery visual alarm that alerts user when at least 8 h of battery life remain.

Battery Requirements: Single battery (2/3-A lithium) in back-mounted transducer module (TM)

- Long life—minimum of 1 yr using the SCBA for 30 min each day
- Less hassle and expense; easily accessible

Indicator Alarms: Choice of audible alarms (bell, plain whistle, or warbling whistle). Battery status indicator on TM—allows user to know battery status before activating the SCBA.

- Informs user of important milestones
- Photodiode—senses ambient light conditions and automatically dims or brightens display so that LED intensity is sufficient but not distracting
- External low air visual alarm—alerts others to user's 25 % and 10 % low air alarm status
- Visual low battery indicator—alerts user to low battery condition while SCBA is in use

HUMAN FACTORS

Communication: Kapton® speaking diaphragm (effective local voice transmission)

Sizes Available: Multiple skirt and nose cup sizes (small, medium, and large), easily fits most facial configurations

Don/Doff Information: Not specified

Comfort/Weight: Apparatus weight fully charged:

- 30 min—8.2 kg x 13.6 kg (18 lb to 30 lb)
- 45 min—10.4 kg to 12.7 kg (23 lb to 28 lb)
- 60 min—12.7 kg x 15.4 kg (28 lb to 34 lb)

Training Requirements: Panther class must attend 2 d

Training Available: At Survivair, our strong commitment to product training and comprehensive product knowledge provides the foundation for our customer-first service philosophy. Our training facility, located in the Survivair corporate offices, is equipped with modern audio-visual equipment. Our education team provides hands-on instruction at the factory or in the field in the overhaul and repair of Survivair products. Graduates of our technical training courses earn diplomas as Survivair-certified repair technicians.

Manuals: Not specified

LOGISTICS

Maintenance Required: Annual flow test shall be done by a Survivair-certified technician to meet the requirements of NFPA 1852. Hydrostatic test requirements—3 yr, 15 yr life (fiberglass); 5 yr, 15 yr life (carbon); 5 yr, unlimited life (aluminum). Overhaul cycle for the apparatus, including the regulators, shall be a period of not less than 6 yr.

Maintenance/Technical Support: Customer service representatives are often asked for information about hydrostatic testing of cylinders, maintenance/overhaul schedule, SCBA, and Hip-Pacs. If you need further information call 800-821-7236 or email Survivair. Contact Survivair for information on modifications, upgrades, and optional equipment available for your Survivair products.

Maintenance Cost: Not specified

Use/Reuse: Not specified

Shelf Life: Not specified

Storage Conditions: -34 °C to 71 °C (-30 °F to 160 °F)

Package Shape/Volume: Not specified

Color: Choice of skirt colors; able to differentiate facepiece sizes by color coding

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: 12 yr warranty, with a 15 yr warranty on the cylinder and a lifetime warranty on the first stage regulator. HUD warranties for not less than 2 yr; other electronic accessories may carry limited warranties of different durations.

GENERAL

SuperCritical Air Mobility Pack (SCAMP) SCBA Open Cycle**Model:** 563001A03; 563-001-03 (stock #)

Supercritical Thermal Systems, Inc.
 P.O. Box 2627
 Longmont, Colorado 80502
 Dr. Hal Gier
 970-535-0384 (Tel)
 970-535-0386 (Fax)
 HalG@superthermal.com

Information Source: <http://www.superthermal.com>**Vendor Status:** The vendor has responded**Availability:** SCAMPs will be manufactured on demand with a 90 d lead time; minimum order of 6 SCAMP units. There will be a loading station to support units.**NIOSH Status:** Units are built and are in pre-test**NIOSH CBRN Number(s):**

TC-84A-3337 (basic 42 CFR Part 84 approval)
 NIOSH approved under part number 563001O2

Certification Date:

Units are built and are pre-tested

Breathing Air Cycle (PSIG):

- 750 psig; this is a cryogenic system, the breathing air cylinder operates at 750 psig

Duration Rating:

- 30 min
- 60 min
- 120 min units will be made

Unit Cost: \$7K**Other Certifications:** NIOSH certification: TC-84A-3337**Configuration Tested:** The SCAMP unit has been tested at NIOSH under Part number 563001O2. The SCAMP has been modified to meet NIOSH objections and is being prepared for resubmittal.

Face Piece—FM.9034.06—CamLock CB40-PP-CNR—\$250

Second Stage Regulator, CDV—FM.066.00—(ISI Compact Demand Valve, 160072)—\$200

Air Bottle, Cryogenic Dewar—563-101-4—(4 L Cryogenic Dewar for SC Air)—\$3K

Back Pack Assembly—563-301-4—(1 h Backpack with Body Cool)—\$3K

Coolant Transfer Tubes—547-006—(Pair of Backpack to Cool Suit Tubes)—\$100

Cool Suit—547-005—(Tube Suit to Provide Body Cooling)—\$800

Related Ensembles: No third party certification

PAPR Description: The SuperCritical Air Mobility Pack® (SCAMP) SCBA uses cryogenic breathing gas technology originally developed for NASA's Apollo and Space Shuttle programs. The SuperCritical Air Mobility Pack® (SCAMP) provides at least 1 h of breathing air while cooling the wearer's body. Although the SCAMP is somewhat smaller and lighter than traditional SCBA, it has more capacity. The SCAMP uses supercritical fluid technology. A high temperature fiberglass backpack contains the SCAMP dewar, a tank that holds the supercritical air [-196 °C (-320 °F)] and replaces the standard SCBA high-pressure tanks. Low system pressure forces the super-cold air out of the dewar and through a series of heat exchangers, which warm the air to a comfortable breathing temperature while the other side of the heat exchangers cool the body through the use of a liquid-cooled garment. The heat exchangers have no moving parts and the system doesn't require user controls. A lighted display on the backpack's harness indicates how much air is left, and an alarm sounds when the tank is less than 25 % full. The vessel can be quickly filled. The SCAMP SCBA 1 h Dewar is approximately the size of a standard 30 min SCBA.

PAPR Application: Flammable environment, fused munitions, explosive atmospheres, IDLH environments or atmosphere with less than 19.5 % oxygen concentration, radiation, biological, deep frozen media, and other

Cylinder Options: No details**EOD Capability:** Not EOD compatible

OPERATIONAL CAPABILITIES

Hazard/Threat Protection Categories: CA, BA, TIC/TIM, and radiological**Protection factor:** LRPL testing not performed at U.S. Army's Protection Factor Test Facility

DESIGN/CONFIGURATION

Visor: Rigid, optical grade polycarbonate visor contains anti-scratch coating for scratch resistance; spectacle kit (Part No.12.001.00) is available

Field of View: >85 %—FOV. Visual acuity meets eye test performance criterion.

Facepiece Compatibility: At this time, there are no products certified with CB40 mask in the APR and/or PAPR configurations. Masks may be freely interchanged between backpacks; with slightly more difficulty it will be possible to interchange the second stage regulator also.

Interoperability with Equipment: Not specified

Heads up Display: A HUD will be mounted on the inside of the facepiece with integral wiring. The display will have 10 LEDs of various colors (green—55 % to 105 %, orange—25 % to 55 %, red—0 % to 25 %) for quantity display. In addition there will be 4 status display LEDs to give status of mask temperature, mask pressure (high, low), and battery voltage. The batteries will be 6 alkaline AA batteries with a nominal lifetime of 5 h.

Battery Requirements: Quantity sensor and alarms—6 alkaline AA batteries with a nominal lifetime of 5 h

Indicator Alarms: For low quantity, pressure is not a good indicator of cryogenic quantity; therefore the SCAMP has a combination of visible, audible, or vibratory alarm for low quantity; visual alarm is in mask HUD; audio alarm is in front of pack, behind ears. Performance of the indicators has not been tested under cold conditions [-30 °C (-22 °F)].

HUMAN FACTORS

Communication: No voice amplifier; speech intelligibility testing has been performed using NIOSH's test method

Sizes Available: Small and large

Don/Doff Information: Not specified

Comfort/Weight: Not specified

Training Requirements: Not specified

Training Available: Training is available for using the SCAMP, loading the SCAMP, and routine maintenance. Customized training provided by the manufacturer is included in the sale at an additional cost. No minimum order is required for the training. Training CD's are available.

Manuals: User instructions are available as a manual and/or CDs. Maintenance manual (hard copy and/or electronic) and CDs are available.

LOGISTICS

Maintenance Required: General surveillance required before and after each use; every 3 yr to 5 yr for vacuum maintenance of dewar

Maintenance/Technical Support: 24 h tech support at 970-535-0384 will be available when deliveries start
Maintenance requirements will be determined by the technical support call; field repairs will be available

Maintenance Cost: Not specified

Use/Reuse: Not specified

Shelf Life: Greater than or equal to 15 yr; requires nothing more than normal storage conditions

Storage Conditions: Not specified

Package Shape/Volume: Not specified

Color: Not specified

Health Hazards and Safety: Not specified

MSDS: MSDS is available

Warranty: Not specified

APPENDIX P—ESCAPE RESPIRATOR DATA FIELDS

APPENDIX P—ESCAPE RESPIRATOR DATA FIELDS

Thirty-eight data fields were used to provide information relating to CBRN NIOSH approved APRs. The 38 data fields are comprised of data fields from the market survey vendor questionnaire requesting specifics about their CBRN APRs. All data fields from the market survey were developed using input from the emergency responder community.

The data fields are grouped according to the following five parameters and the number of data fields in each parameter:

- General (13 data fields).
- Operational Capabilities (4 data fields).
- Design/Configuration (4 data fields).
- Human Factors (4 data fields).
- Logistics (13 data fields).

1.0 General

1.1 Product Information

Product information, including name, model, and/or stock number, is used to identify the escape respirator. The stock and/or model number indicates the number(s) that are used to uniquely identify the equipment. It should include the stock identification or national stock number, if the escape respirator has one.

1.2 Manufacturer

Manufacturer identifies the company that manufactured the escape respirator (to include the name, address, telephone number(s), fax number, and point-of-contact).

1.3 Source

Source indicates where the escape respirator information was obtained. Potential sources include past market surveys, internet websites, conferences, or commerce business daily announcements.

1.4 Information Last Updated

This data field indicates when the information was last updated by the vendor.

1.5 NIOSH CBRN Certification

Escape respirators must meet minimum requirements in determining the effectiveness of air-purifying and self-contained escape respirators that address CBRN materials identified as inhalation hazards from possible terrorist events for use by the general working population.

The Escape Respirator must meet the minimum requirements based on existing National and International Standards. CBRN APR requirements can be found in 42 CFR, Part 84, Subparts A, B, D, E, F, and G. CBRN SCBA requirements can be found in 42 CFR, Part 84, Subpart H, with minimum service time of 15-min.

1.6 NIOSH CBRN Certification Information

This data field provides the NIOSH CBRN certification number and the date of certification, or, if pending certification, the date of expected certification.

1.7 Other Certifications

Other certifications include applicable testing and certifications [include testing organization(s) and standard(s) such as mil-standards].

1.8 Independent Testing

Independent testing information includes any test data obtained from sources regarding any part of the equipment (e.g., validation testing including materials and ensemble testing such as abrasion, tear, wear, burst, and permeation testing). Human factors testing results should be included as well (either quantitative or qualitative).

1.9 Escape Respirator Description

The description category provides an overall description of the escape respirator and any features that make it unique.

1.10 Escape Respirator Application

This data field identifies the areas where the escape respirator is most likely to be used per vendor or manufacturer recommendation (e.g., tactical operations, crisis management, etc.), or those areas where the escape respirator should not be used (i.e., in a flammable environment, etc.).

1.11 Unit and Component Cost (MSRP)

Unit and component costs include details on the complete respiratory system cost, as well as individual components (e.g., canisters, cartridges, etc.) costs. This price is not a special Government price.

1.12 Availability

Availability indicates the lead time for acquiring initial quantities of the APRs after the order has been placed, as well as repair and maintenance parts. Provide if the equipment is disposable or nondisposable.

1.13 References/User(s) of Product

*References/user(s) of product identifies organizations (i.e., military use, commercial applications, civil-service instrument, etc.) that are currently using the piece of equipment. This information may include the average number of units each client has in operation and the average number of years these units have been in use. **References must be verified with consent from the users before including the contact information.***

2.0 Operational Capabilities

2.1 Hazard/Threat Protection Categories

This data field provides references to the protection capability of the respiratory equipment to protect against CBRN and TICs/TIMs.

2.2 Duration of Protection

Duration of protection is the amount of time the equipment provides adequate protection in a CBRN environment. The NIOSH CBRN Standard for APERs requires that escape respirators be rated as 15-min, 30-min, 45-min, or 60-min respirators.

This data field indicates the type and duration of protection, i.e., 15-min, 30-min, 45-min escape only NIOSH CBRN; 15-min, 30-min, 45-min escape only NIOSH CBRN with carbon monoxide; 15-min, 30-min, 45-min, or 60-min escape only NIOSH CBRN with “Chemical” specific; or 15-min, 30-min, 45-min escape only NIOSH CBRN with “Chemical” specific and with carbon monoxide.

2.3 Additional Hazardous Threats

This data field provides information on any additional hazardous threats, beyond the minimum NIOSH CBRN requirements, that the manufacturer offers.

2.4 Operational Limitations

This data field indicates whether the manufacturer provides specific guidance and warnings that relate to the use of the respiratory equipment in atmospheres with less than 19.5 % oxygen concentration. Also, indicated if the manufacturer has specific guidance or recommendations related to the use of the respiratory equipment in high heat and humidity environments.

3.0 Design/Configuration

3.1 Types of Escape Respirators

Two design configurations of escape respirators are covered under the NIOSH escape respirator standard. One design is a SCBA type escape respirator and consists of a hood with a tightly fitting neck piece and a contained source of breathing gas. The hood provides a barrier against contaminated outside air, and the user breathes air from the attached source. The other type is

an air purifying escape respirator (APER) that has a filter canister mounted on the hood. The user breathes outside air through the canister, which filters out harmful contaminants before the air is inhaled. The air purifying escape respirator category then allows for additional options in performance.

This data field indicates whether the escape respirator is an APER or a SCBA type escape respirator. Depending on the configuration of the respirator, indicate if the respirator includes powered air-blower.

3.2 Configuration

This data field indicates the fit of the escape respirator, either full-facepiece tight-fitting or hooded with a neck dam.

3.3 Visor

The visor data field indicates if the lens is a single or dual ocular lens, and provides the name of the material used to fabricate the visor. Other visor information includes the hardness or flexibility of the visor, if the lens has infrared protection, whether the lens is made from antifogging material, and if the lens is scratch resistant.

3.4 Nose Cup

This data field indicates if the respirator has a nose cup and mouthpiece. A nose cup helps reduce CO₂ as well as moisture in a hood.

4.0 Human Factors

4.1 Communications

Communications interface capability refers to the ability of the ensemble to interface with a communications system (network capability; hardwire capability; RF communication, etc.).

4.2 Weight

This data field details the weight associated with a donned and functioning escape respirator. If a filtration canister is required with the escape respirator, the weight of the canister is included in the total weight as well. The NIOSH CBRN Standard for APERs does not include any weight requirements.

4.3 Don/Doff Information

The don/doff information indicates whether the system requires assistance for donning and/or doffing and the average time for this activity. The NIOSH CBRN Standard for APERs requires the time to don the respirator from the ready-to-use configuration to shall be no greater than 30 s.

4.4 Sizes Available

The sizes available data field provides available sizes for an item, to include both male and female when appropriate.

5.0 Logistics

5.1 Maintenance Requirements

Although emergency escape respirators are considered one time use items, periodic surveillance is required to ensure that the respirator is ready to use in an emergency situation. Maintenance requirements are the services and parts required to keep the system at its peak operational readiness (e.g., preventative maintenance).

5.2 Maintenance Cost

Maintenance cost is the cost required to maintain the system at its operational readiness. This cost will be based on equipment usage rates (i.e., cartridges, hoses, cylinders, etc.).

5.3 Storage Conditions

Storage conditions are the recommended storage procedures and environment, and include any factors that decrease shelf life (e.g., UV, critical temperature).

5.4 Useful life

Standards require that the item be ready to use in its stored condition. Maximum useful life that NIOSH allows is 5-yr storage.

5.5 Disposal

Most emergency escape respirators are single use items and must be discarded in a safe manner. This data field indicates if procedures are available to decontaminate and/or dispose of used equipment.

5.6 Training

Training refers to the amount of instruction time the operator needs to become proficient in using the ensemble. It also includes whether the respirator requires fit-testing (whether the respirator can properly fit on the wearer's face). A written respiratory protection program must be implemented in meeting all the requirements of OSHA 29 CFR 1910.134, including training, medical evaluation, and fit testing. This data field indicates what training is required and what training is offered by the manufacturer. This includes any initial training and recertification training that is available.

5.8 Manuals

This data field indicates the manuals that are available from the manufacturer. User instructions include an APR canister approval label with CBRN Cap 1 protection or it is included in the packaging.

5.9 Color

The color data field indicates if the equipment can be color coded for evacuation purposes or for emergency response. The NIOSH CBRN Standard does not contain any color requirements.

5.10 Packaging, Volume, and Shape

The package size and volume data field provides the external dimensions of the respirator and components when packaged (for storage and transportability). Package shape is also important when considering storing and transporting the ensemble (i.e., requirements may differ if the product package will be stored in a warehouse or on a vehicle).

5.11 Health Hazards and Safety

The health hazards data field identifies all materials that possess a potential health hazard. An example of potential health hazard is the use of latex, an allergen.

5.12 Material Safety Data Sheet

An MSDS is required if any of the materials used to manufacture the equipment possess a potential health hazard. Also, include if an MSDS is available for the materials or for any of the chemicals in the cartridges.

5.13 Warranty

Warranty is the length of time the equipment is guaranteed by the manufacturer, including the terms of the warranty (parts and labor). This data field also includes specific details on what is covered in the warranty, along with the effective lifetime of the warranty, any restrictions in place by the manufacturer, the specific parts and labor that are covered, and the expected useful lifetime of the equipment.

APPENDIX Q—ESCAPE RESPIRATOR INDEX AND DATA SHEETS

APPENDIX Q—ESCAPE RESPIRATOR INDEX AND DATA SHEETS

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3	Duram CEMBAYO Chem/Bio Escape Mask	Duram Mask A.C. Ltd.	Q-4
4	ILC Dover SCape® CBRN30	ILC Dover, Inc.	Q-6
5	MSA Safe Escape™ CBRN Respirator	Mine Safety Appliances Company	Q-8
6	MSA Response™ Escape Hood	Mine Safety Appliances Company	Q-10
7	North Escape Respirator (ER2000CBRN)	North Safety Products	Q-12
8	POTOMAC® Emergency Escape Mask	Helsatech GmbH (Potomac Protection Products—distributor)	Q-14
9	Quick Protective Systems Quick2000®	Quick Protective Systems Inc. (QPS)	Q-16
10	Quick Protective Systems QuickPro®	Quick Protective Systems Inc. (QPS)	Q-19
11	SafetyTech Chemihood	SafetyTech International, Inc.	Q-21
12	Scott SCRAM® Escape Respirator	Scott Health and Safety	Q-22
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18	ISI Emergency Escape Breathing Apparatus	International Safety Instruments	Q-30
19	North Emergency Escape Breathing Apparatus (EEBA)	North Safety Products	Q-32

GENERAL

Avon EH20 Escape Hood

Model: EH20

Avon Protection Systems
 503 Eighth Street
 Cadillac, Michigan 49601
 John Bevans, Project Manager
 231-779-6200 (Tel)
 231-779-6202 (Fax)
 john.bevans@avon-rubber.com
 http://www.avon-rubber.com
 http://www1.rkb.mipt.org/
 Responder Knowledge Database

Vendor Status: The vendor has not responded



NIOSH Status: None

Escape Hood Type: APER—at least 20 min duration

Unit Cost: Not specified

Component Cost: Not specified

Other Certifications: Not specified

Independent Testing: Not specified

Configuration: Not specified

Escape Hood Description: The Avon EH20 Escape Hood is a single use portable escape hood that provides at least 20 min protection from principal airborne CBRN threat agents and potential splashes, allowing escape to a safe area. It comes in one size fits most adults, has a high protection factor, and can be donned in less than 30 s. The Avon EH20 Escape Hood can be carried on a utility belt or in a briefcase.

Escape Hood Application: Not specified

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: Not specified

Protection Categories: Not specified

Duration Rating: At least 20 min

Operational Limitations: Not specified

Design: Not specified

DESIGN/CONFIGURATION

Escape Respirator Type: APER

Configuration: Not specified

HUMAN FACTORS

Communication: Not specified

Weight: Not specified

Don/Doff Information: Less than 30 s

Sizes Available: One size fits all

LOGISTICS

Maintenance Required: Not specified

Storage Conditions: It is foil packed for a 10 yr shelf life

Storage Life: 5 yr

Disposal: Single use

Use/Reuse: Single use

Training: Not specified

Manuals: Not specified

Color: Not specified

Package Shape/Volume: Between 0.3 mm³ x 3 mm³
 (0.1 ft³ and 1 ft³)

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: Not specified

GENERAL

Dräger DefendAir® Gas Mask**Model:** R54838

Dräger Safety Inc.
 101 Technology Drive
 Pittsburgh, PA 15275-1057
 800-922-5518 (Tel)
 412-858-1737 (Tel)
 800-822-5519 (Fax)
 412-787-2207 (Fax)
<http://www.draeger-safety.com>
<http://www1.rkb.mipt.org/>
 Responder Knowledge Database

Vendor Status: The vendor has not responded**NIOSH Status:** TC-14G-266 (basic 42 CFR 84 approval)**Escape Hood Type:** APER—15 min duration**Unit Cost:** \$170**Component Cost:** Not specified**Other Certifications:** Not specified**Independent Testing:** Not specified**Configuration:** Not specified

Escape Hood Description: The DefendAIR is designed for over 15 min of protection against toxic gases, including nerve/blood agents and tear gas that may be encountered by civilians, law enforcement, or emergency response personnel. Communication is clear since there are no mouth bits or nose clips required. It can be worn with glasses or by those who have beards or long hair as well. DefendAIR® has an integrated combination canister. The canister's P100 filter is the appropriate media for filtering radionuclide and biological agents (e.g., anthrax). Additionally, a layer of activated and impregnated ASZM-TEDA carbon is included to filter gas and vapors (e.g., chemical warfare agents).

Escape Hood Application: Not specified

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: CA and TIC/TIM**Protection Categories:** Tear Gas CS—3 ppm—>8 h

Tear Gas CN—16 ppm—>8 h

DMMP—3000 mg/m³—>20 minSarin (GB)—4000 mg/m³—>20 minCyanogen chloride (CK)—4000 mg/m³—>20 min

Ammonia—500 ppm—>30 min

Chlorine—1000 ppm—>95 min

Carbon tetrachloride—1000 ppm—>70 min

Hydrogen cyanide—1000 ppm—>85 min

Sulfur dioxide—500 ppm—>115 min

Phosgene (CG)—1000 ppm—>105 min

Duration Rating: 15 min**Operational Limitations:** Not specified

Design: The hood system is designed to protect against hazards by providing a maximum 1000 protection factor, effective filtering capability, and protection from CO₂ buildup

DESIGN/CONFIGURATION

Escape Respirator Type: APER

Configuration: The hood system is designed to protect against hazards by providing a maximum 1000 protection factor, effective filtering capability, and protection from CO₂ buildup

HUMAN FACTORS

Communication: Allows for normal speaking

Weight: Not specified

Don/Doff Information: Less than 10 s

Sizes Available: One size fits all

LOGISTICS

Maintenance Required: No interval maintenance required while unit is maintained in original sealed container

Storage Conditions: Maximum temperature range is -20 °C to 60 °C (-4 °F to 140 °F)

Storage Life: 5 yr

Disposal: Not specified

Use/Reuse: Not specified

Training: Not specified

Manuals: Not specified

Color: Not specified

Package Shape/Volume: 153 mm (6 in) diameter x 84 mm (0.3 in) height

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: Not specified

GENERAL

Duram CEMBAYO Chem/Bio Escape Mask**Model:** DM-ASPI-54C-HV-YE/BL; IPSEK™ (Integrated Public Evacuation/Emergency Kit)

Duram Mask A.C. Ltd.
 Kibbutz Ramat-Hakovesh
 Israel 44930
 972-9-7474458 (Tel)
 972-9-7474626 (Tel)
 972-9-7474479 (Fax)
 info@durammask.co.il
 U.S. Distributor
 Steven Baker
 Alliance Security Products Inc.
 1 West Street, Suite 3508
 New York, New York 10004
 212-248-2828 (Tel)
 212-248-4874 (Tel)
 212-248-4939 (Fax)
<http://www.durammask.co.il/home.html>
<http://www.SafetySquare.com>
<http://www.myipsek.com>
<http://www1.rkb.mipt.org/>
 Responder Knowledge Database

**Vendor Status:** The vendor has responded**NIOSH Status:** None**Escape Hood Type:** APER—electrostatic particle filter; 15 min duration. 5 min to 15 min emergency escape respirator for use in the event of a toxic release of CB agents**Unit Cost:** \$129—Volume discounts offered**Component Cost:** Not specified**Other Certifications:** Flame retardant: UL 94 V-O; Fire-resistant to the requirements of NFPA 701**Independent Testing:** Not specified**Configuration:** Not specified

Escape Hood Description: A personal emergency device for short-term respiratory protection during escape from an area of low concentration of CBs. Features of the Cembayo include the following: pocket-size; dons within seconds, no adjustment straps; one size fits all; strong, fire-resistant, elastic rubber hood, protects the entire head and seals comfortably at the neck; large visor, made of flame-retardant transparent film, allows a wide field of view; high-efficiency, electrostatic particle filter, with extremely low pressure-drop to allow easy breathing; layers of activated charcoal with special impregnation to absorb toxic gases; a unique breathing device (patent pending) enables rapid exhalation and improves the physiological conditions for the user, preventing built-up of heat or vapor inside the mask; training model available; and available in two colors, yellow and black.

IPSEK™ (Integrated Public Evacuation/Emergency Kit) IPSEK™ systems provide real-time protection in the event of a CBRNE (chemical biological radiological nuclear explosive) incident as well as protection from smoke and irritants. Kit includes: Escape hood (Model DM-ASPI-54C-HV-YE/BL); protection (1 personal escape hood, 1 pair of latex gloves, and 1 potassium iodide tablet); detection (1 sheet of detection paper); decontamination (1 skin decontamination wipe); and 1 custom-made carrying pouch with belt loop and one (1) 12 h safety light stick.

Escape Hood Application: Low concentration of CBs

References: Transportation Authority during 2004 Olympics, U.S. Army, police departments, governmental agencies, emergency management teams, nuclear facilities, security agencies, European Union, World Congress Center, and media and financial institutions

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: Flame retardant: UL 94 V-O. Protection against biological agents as evidenced by Oil and NaCl (salt) aerosol tests.

Protection Categories: External polyester screen, fire resistant to the requirements of NFPA 701. Electrostatic and melt blown combination high efficiency particle filter (HEPA). Layers of activated charcoal cloth with a special impregnation against acid gases.

Filter performance for chemicals and aerosols:

Cyanogen chloride (CK)—100 mg/m³—30 L/min—>15 min

Dimethyl methyl phosphonate (DMMP)—250 mg/m³—30 L/min—>15 min

Aerosol: NaCl (salt)—99.97 %—117 Pa—95 min

Duration Rating: 15 min

Operational Limitations: Not specified

Design: Hooded with neck dam; single lens; visor of ETFE film (a copolymer of polytetrafluoroethylene with ethylene monomer). Breathing device combining 2 valves for exhalation and a soft mouthpiece, all in one unit.

DESIGN/CONFIGURATION

Escape Respirator Type: APER—electrostatic particle filter

Configuration: Hooded with neck dam; single lens; visor of ETFE film (a copolymer of polytetrafluoroethylene with ethylene monomer). Breathing device combining 2 valves for exhalation and a soft mouthpiece, all in one unit.

HUMAN FACTORS

Communication: Not specified

Weight: Approx (package) weight is 190 g to 200 g (0.42 lb to 0.44 lb)

Don/DoFF Information: Dons within seconds; no adjustment straps

Sizes Available: One size fits all

LOGISTICS

Maintenance Required: Not specified

Storage Conditions: Not specified

Storage Life: Not specified

Disposal: Disposable

Use/Reuse: Disposable

Training: Training model available

Manuals: Not specified

Color: Available in two colors—yellow and black

Package Shape/Volume: Approx 19 cm x 15 cm x 4 cm (7.48 in x 5.91 in x 1.57 in). Approximately 0.001 m³ (0.04 ft³).

The mask is stored in a personal carrying pouch. Optional wall mounted box available for storing 2 masks or 3 masks.

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: Not specified

GENERAL

ILC Dover SCape® CBRN30**Model:** SCape CBRN 30 part numbers 6000–10435

ILC Dover, LP
 One Moonwalker Road
 Frederica, Delaware 19946-2080
 LeRoy Garey
 302–335–3911 (Tel)
 302–335–0762 (Fax)
 gareyl@ilcdover.com
 http://www.ilcdover.com
 http://www1.rkb.mipt.org/
 Responder Knowledge Database

**Vendor Status:** The vendor has responded**Availability:** Stock item**NIOSH Status:** TC–14G–0277CBRN, 10/28/2005. Escape only CBRN 30; approved for escape for up to 30 min from CBRN agents.**Escape Hood Type:** APER—Integrated filter/blower; 30 min duration per NIOSH CBRN standard**Unit Cost:** ~ \$185 each—call for volume pricing**Component Cost:** Not specified**Other Certifications:** 42 CFR, Part 84, Subparts A, B, D, E, F, and G**Independent Testing:** Too numerous to list**Configuration:** Not specified

Escape Hood Description: The SCape CBRN30 is a one size fits all product designed to protect individuals during a CBRN incident. Unlike most escape respirators, the SCape CBRN30 is powered by a blower that creates a positively pressured hood that provides the highest levels of protection and affords the untrained civilian one of the most user friendly hoods on the market. The Global Scape Hood features an integrated filter/blower assembly designed to protect against not only the chemical war gases, but also against the TICs and TIMs listed in the NIOSH escape respirator specification. The SCape CBRN30 utilizes a very comfortable neck seal and provides great visibility with a clear, oversized visor. When the product is removed from its package the integral blower initiates automatically thereby providing positive pressure and trusted protection to the wearer. The blower is made of an impact resistant polycarbonate. It includes a battery which powers the blower for at least 4 h, and also includes an LED, which illuminates when the blower is operational (this is to provide positive feedback to the hearing impaired).

Escape Hood Application: CBRN approved for escape for up to 30 min. National Security Agencies, state and local governments, Homeland Security personnel, military dependents, private citizens, and emergency response personnel; health care workers, private industry, and public safety workers.

References: Not applicable

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: Common chemical risks; such as, ammonia, chlorine gas, and biological inhalation hazards and materials, such as anthrax, which may become airborne due to accidental discharge or terrorist activities. Visor and hood materials tested against agents GB, HD, and VX. Approved without the CO option, which means that it has not been approved for escape use in a carbon monoxide environment.

Protection Categories: Equals military C2A1 filter performance**Duration Rating:** 30 min per NIOSH CBRN standard**Operational Limitations:** No specific guidance for use in high heat and humidity. Guidance for use in <19.5 % oxygen concentration.

Design: Hooded with neck dam. Includes powered air-blower. Single lens; flexible; ILC Dover Proprietary material; visor contains coatings. No uncomfortable nose cup (as in most unblown hoods). Wide field of vision. Transparent hood material to ease user recognition and reduce claustrophobia.

DESIGN/CONFIGURATION

Escape Respirator Type: APER—ESCAPE ONLY CBRN 30; approved for escape for up to 30 min from CBRN agents

Configuration: Hooded with neck dam. Includes powered air-blower. Single lens; flexible; ILC Dover Proprietary material; visor contains coatings. No uncomfortable nose cup (as in most unblown hoods). Wide field of vision. Transparent hood material to ease user recognition and reduce claustrophobia.

HUMAN FACTORS

Communication: Allows for normal speaking and hearing. Permits use of telephones, cell phones, and other communication devices.

Weight: ~1.18 kg (2.6 lb) (including case)

Don/DoFF Information: 21 s to 30 s; no assistance needed

Sizes Available: One size fits all

LOGISTICS

Maintenance Required: None—one time use item. Battery operates for 4 h.

Storage Conditions: Maximum long term storage temperature range is -18 °C to 54 °C (0 °F to 130 °F). Do not store in areas with excessive moisture. At all times, the Global Scape Hood must be kept in the unopened protective sealed pouch and box. Storage locations should provide for protection of the Global Scape Hood from dust and dirt, sunlight, extreme heat or cold, excessive moisture, damaging chemicals, and mechanical damage, such as crushing, puncturing, and abrasion.

Storage Life: 4 yr to 5 yr

Disposal: Cannot be cleaned and reused. No procedures to decontaminate/dispose of used equipment.

Use/Reuse: Cannot be cleaned and reused. No procedures to decontaminate/dispose of used equipment.

Training: No training required. Designed for civilians and untrained personnel.

Manuals: Manual and video available

Color: No color coding available

Package Shape/Volume: Less than or equal to 0.014 m³ (0.5 ft³). Rigid (metal or plastic).

Health Hazards and Safety: No latex

MSDS: MSDS is available

Warranty: Not specified

GENERAL

MSA Safe Escape™ CBRN Respirator**Model:** Safe Escape part numbers 10052048, 10052049, 10052070

Mine Safety Appliances Company
 PO Box 428
 Pittsburgh, Pennsylvania 15230-0426
 Evan K. Erickson
 800-251-9383, ext. 274 (Tel)
 724-733-9274 (Tel)
 724-733-8573 (Fax)
 evan.erickson@msanet.com
 http://www.msanet.com
 http://www1.rkb.mipt.org/
 Responder Knowledge Database

**Vendor Status:** The vendor has responded**Availability:** In stock**NIOSH Status:** TC-14G-0276CBRN. Escape only CBRN 15; approved for escape for up to 15 min from CBRN agents.**Escape Hood Type:** APER**Unit Cost:** \$170 list—estimated selling price**Component Cost:** No replacement components**Other Certifications:** None**Independent Testing:** None**Configuration:** Not applicable

Escape Hood Description: The MSA Safe Escape is a respirator designed to provide above-the-neck protection against CBRN threats. The CBRN canister provides protection against all challenges that are listed in the NIOSH CBRN standard. Product synopsis: Homeland security respiratory protection for emergency escape. Clear hood-style with bonded lens and CBRN canister for 15 min escape protection. Sized for individual fit. Packed securely in easy-open but tamper-evident hexagonal storage case for easy group caching, with prominent end labels for easy size ID. Optional straps attach case to belt and leg or over shoulder. CBRN high-efficiency particulate filter and activated carbon canister. Air flows through the canister directly into the nose cup; inlet check-valves maximize carbon performance; air exits directly through the exhalation valve. Canister is permanently bonded to the respirator coupling nut for secure connection.

Escape Hood Application: CBRN approved for escape for up to 15 min**References:** None to date

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: CBs and tear gas. CBRN high-efficiency particulate filter and activated carbon canister. Air flows through the canister directly into the nose cup; inlet check-valves maximize filter performance; air exits directly through the exhalation valve. Canister is permanently bonded to the respirator coupling nut for secure connection. Approved without the CO option, which means that it has not been approved for escape use in a carbon monoxide environment.

Protection Categories: HD-vapor—50 mg/m³—3 mg/m³—>45 minGB—210 mg/m³—1.05 mg/m³—>45 min

Ammonia—1250 ppm—25 ppm—>40 min

Cyanogen chloride—150 ppm—2 ppm—>30 min

Cyclohexane—1300 ppm—10 ppm—>40 min

Formaldehyde—250 ppm—1 ppm—>120 min

Hydrogen cyanide—470 ppm—4.7* ppm—>200 min

Hydrogen sulfide—500 ppm—5 ppm—>200 min

Nitrogen dioxide—100 ppm—1 ppm NO₂**—>50 min

Phosgene—125 ppm—1.25 ppm—>450 min

Phosphine—150 ppm—0.5 ppm—>290 min

Sulfur dioxide—750 ppm—5 ppm—>30 min

*Sum of HCN and CaN₂**Nitrogen dioxide breakthrough is monitored for both NO₂ and NO

The breakthrough is determined by which quantity, NO₂ or NO, reaches breakthrough first

Duration Rating: 15 min per NIOSH CBRN standard

Operational Limitations: No specific guidance for use in high heat and humidity—standard instructions. Guidance for use in <19.5 % oxygen concentration.

Design: Hood-style respirator with inside-the-hood self-adjusting cradle-type head straps: no external straps to catch on things during escape; translucent hood design with single large bonded lens; high-performance laminate hood material resists chemical interaction; secure protection, wearer looks and sounds like self (no nose clip or mouth bit); wide field of view for better visibility; reduces claustrophobia; no noisy (crinkling) problems of cellophane hood, so it's easy to hear emergency instructions, vehicles, etc., while respirator is in use; and accommodates long hair, glasses, facial hair. Soft, high-stretch rubber neck seal conforms to neck contours and irregularities; is sized for individual custom fit; is comfortable, yet secure enough to provide a reliable seal. Optional carrying strap allows easy attachment of storage case to leg and belt, or used as shoulder strap, for easy access.

DESIGN/CONFIGURATION

Escape Respirator Type: APER—ESCAPE ONLY CBRN 15; approved for escape for up to 15 min from CBRN agents

Configuration: Hood-style respirator with inside-the-hood self-adjusting cradle-type head straps: no external straps to catch on things during escape; translucent hood design with single large bonded lens; high-performance laminate hood material resists chemical interaction; secure protection, wearer looks and sounds like self (no nose clip or mouth bit); wide field of view for better visibility; reduces claustrophobia; no noisy (crinkling) problems of cellophane hood, so it's easy to hear emergency instructions, vehicles, etc., while respirator is in use; and accommodates long hair, glasses, facial hair. Soft, high-stretch rubber neck seal conforms to neck contours and irregularities; is sized for individual custom fit; is comfortable, yet secure enough to provide a reliable seal. Optional carrying strap allows easy attachment of storage case to leg and belt, or used as shoulder strap, for easy access.

HUMAN FACTORS

Communication: No communications interface capability. Easy to hear emergency instructions, vehicles, etc., while respirator is in use.

Weight: 0.68 kg (1.5 lb)

Don/Doff Information: 11 s to 20 s; easy, quick, no-assistance donning

Sizes Available: Small, medium, and large; easily identifiable by color and letter on storage case. Neck and nose cup sizing kit (2 minimum-neck-size measuring bands plus 3 sizing cups, for a customized fit.

LOGISTICS

Maintenance Required: No maintenance

Storage Conditions: Foil-bagged respirator ensures protection from ambient environment

Storage Life: Respirator packed securely inside case has 5 yr shelf-life from date of manufacture

Disposal: Cannot be cleaned and reused. No procedures to decontaminate/dispose of used equipment.

Use/Reuse: Cannot be cleaned and reused. No procedures to decontaminate/dispose of used equipment.

Training: Minimum training needed. Written respiratory protection program; fit-testing required. Training canister is available. Trainer version of Safe Escape Respirator, hood only. Training canister is available. Trainer version of Safe Escape Respirator, hood only.

Manuals: Instructions and training (trilingual instruction manual and training CD for easy individual training, as needed)

Color: Standard respirator has color-coded labels for sizes—S, M, L; tactical version has black and gray labels. Cases nest together, with instant identification via color code and clearly marked S,M,L on prominent end label.

Package Shape/Volume: Less than or equal to 0.014 m³ (0.5 ft³). Vacuum packed—rigid carrier available. Tamper-evident hexagonal storage case. Distinctive black polyethylene Hextreme™ hexagonal storage case is secure, yet easy to open case for immediate use; hexagonal shape promotes strong but lightweight storage, easy for group caching.

Health Hazards and Safety: Neck dam contains natural rubber (trace amounts of latex)

MSDS: MSDS is available

Warranty: Standard commercial—18 mo

GENERAL

MSA Response™ Escape Hood**Model:** 10022208

Mine Safety Appliances Company
 PO Box 428
 Pittsburgh, Pennsylvania 15230-0426
 Evan K. Erickson
 800-251-9383, ext. 274 (Tel)
 724-733-9274 (Tel)
 724-733-8573 (Fax)
 evan.erickson@msanet.com
<http://www.msanet.com>
<http://www1.rkb.mipt.org/>
 Responder Knowledge Database

**Vendor Status:** The vendor has not responded**NIOSH Status:** None**Escape Hood Type:** APER—at least 15 min duration**Unit Cost:** Not specified**Component Cost:** Not specified**Other Certifications:** Not specified**Independent Testing:** Not specified**Configuration:** Not specified

Escape Hood Description: MSA Response™ Escape Hood with CBA/RCA canister is a clear hood manufactured with a high-performance laminate material. The canister contains a pleated high-efficiency (P-100) filter to remove aerosols, radio nuclides, and solid particulates, and an impregnated activated carbon bed to adsorb gases and vapors. The canister used in the hood contains 50 % more carbon than similar canisters used by the U.S. military. The Response Escape Hood has a large lens and translucent hood to allow better visibility, face recognition, and help reduce claustrophobia, and an integrated nose cup, so wearers can breathe and speak normally. Its unique nose cup also helps reduce lens fogging and carbon dioxide buildup by directing airflow inside the hood. The hood is suitable for high-profile office environments, government agencies or embassies, or law enforcement or first responders. It fits most any size and is compatible with long hair, glasses, or a beard.

Escape Hood Application: Not specified

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: Aerosols, radio nuclides, and solid particulates, and an impregnated activated carbon bed to adsorb gases and vapors

Protection Categories: DMMP—1000 mg/m³—>63 min

Sarin (GB)—1000 mg/m³—>54 min

Mustard vapor (HD)—200 mg/m³—>60 min

Hydrogen cyanide (AC)—550 mg/m³—>60 min

HCN—550 mg/m³—>60 min

CS tear gas—23 mg/m³—>480 min

CN tear gas—101 mg/m³—>480 min

Cyanogen chloride (CK)—500 mg/m³—>60 min

Duration Rating: At least 15 min**Operational Limitations:** Not specified**Design:** Not specified

DESIGN/CONFIGURATION

Escape Respirator Type: APER**Configuration:** Not specified

HUMAN FACTORS

Communication: Allows for normal speaking

Weight: Between 0.45 kg and 1.4 kg (1 lb and 3 lb)

Don/Doff Information: Less than 10 s

Sizes Available: Fits Most Sizes

LOGISTICS

Maintenance Required: Not specified

Storage Conditions: Not specified

Storage Life: Between 4 yr and 5 yr

Disposal: Not specified

Use/Reuse: Not specified

Training: Not specified

Manuals: Not specified

Color: Not specified

Package Shape/Volume: Between 1.4 mm³ and 0.3 mm³ (0.05 ft³ and 0.10 ft³)

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: Not specified

GENERAL

North Escape Respirator (ER2000CBRN)

Model: ER2000CBRN

North Safety Products
2000 Plainfield Pike
Cranston, Rhode Island 02921
Lynn Aurelius
858-722-1200 (Tel)
401-943-4400 (Tel)
401-275-2618 (Fax)
Lynn.Aurelius@NorthSafety.com
<http://www.northsafety.com>



Vendor Status: The vendor has responded

Availability: In stock

NIOSH Status: TC-14G-0281CBRN, 02/27/2006. Escape only CBRN 30; approved for escape for up to 30 min from CBRN agents.

Escape Hood Type: APER—dual side mounted cartridges; 30 min duration

Unit Cost: \$200

Component Cost: One time use—no replacement components sold

Other Certifications: Not specified

Independent Testing: Organizations: U.S. Army RDECOM, NIOSH, Assay Technology Inc., Sypris Test and Measurement, AJE Testing & Research Inc.

Tests: NIOSH CBRN performance requirements for live agent testing (LAT), human fit testing (LRPL), cartridge service life, human and machine CO₂ testing, fogging tests, and field of view tests. Test dates: August 2004 to April 2005.

Configuration: Hood with carry bag—ER2000CBRN—North Safety Products

Carry bag—ER2000—North Safety Products

Escape Hood Description: The Air Purifying Escape Respirator 2000 is based on the NIOSH/CBRN testing requirements and meets the 30 min time classification. Unique to the North unit is the design—dual side mounted cartridges mounted low and on the side versus a single canister mounted in the front. Two side mounted cartridges allow for better weight distribution and better visibility, particularly when looking down (important when “escaping and exiting” in a hurried environment). Dual cartridges also reduce the amount of “bouncing” that might take place due to the weight of a canister. Hood with carry bag (ER2000CBRN)—North Safety Products; Carry bag (ER2000)—North Safety Products.

Escape Hood Application: Radiation and biological

References: Not applicable

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: CA, BA, TIC/TIM, and radiological

Protection Categories: Approved without the CO option, which means that it has not been approved for escape use in a carbon monoxide environment

Duration Rating: 30 min

Operational Limitations: No specific guidance for use in high heat and humidity. Not for use in atmospheres with <19.5 % oxygen concentration.

Design: Hooded with neck dam; oral/nasal cup; one size. Single lens; flexible; polyurethane visor does not contain coatings.

DESIGN/CONFIGURATION

Escape Respirator Type: APER—dual side mounted cartridges

Configuration: Hooded with neck dam; oral/nasal cup; one size. Single lens; flexible; polyurethane visor does not contain coatings.

HUMAN FACTORS

Communication: No communications interface capability

Weight: 0.64 kg (1.4 lb)

Don/Doff Information: 21 s to 30 s; no assistance needed

Sizes Available: One size fits all

LOGISTICS

Maintenance Required: None—Respirator shipped in a sealed Mylar bag for one time use. Product has a 5 yr shelf life from date of manufacture.

Storage Conditions: Respirator should be stored in a clean, dry area, and away from extreme temperatures

Storage Life: 4 yr to 5 yr

Disposal: Cannot be cleaned and reused. No procedures to decontaminate/dispose of used equipment.

Use/Reuse: Cannot be cleaned and reused. No procedures to decontaminate/dispose of used equipment.

Training: <8 h not provided by the manufacturer. Written respiratory protection program; no fit-testing required.

Manuals: Manual—user instructions are included with complete respirator

Color: No color coding available. Custom logo/markings may be considered based upon market demand.

Package Shape/Volume: Less than or equal to 0.014 m³ (0.5 ft³). Soft sided pouch; vacuum packed.

Health Hazards and Safety: No health hazards

MSDS: MSDA is not available

Warranty: 5 yr from date of manufacture

GENERAL

POTOMAC® Emergency Escape Mask

Model: P3

Helsatech GmbH
 Box 1025
 Bayreuther Street 3–11
 95482 Gefrees, Germany
 Hermann Wolfrum
 +49.9254.80–154 (Tel)
 +49.9254.9612–600 (Fax)
 hermann.wolfrum@de.helsa.com
 helsatech@de.helsa.colm
 Potomac Protection Products (distributor)
 6615 W. Boynton Beach Blvd. # 320
 Boynton Beach, FL 33437
 561–244–8337 (Tel)
 561–244–8339 (Fax)
 dee@potomacprotection.com
 info@potomacprotection.com
<http://www.potomacprotection.com/>
<http://www1.rkb.mipt.org/>
 Responder Knowledge Database (RKB)



Vendor Status: The vendor has not responded

NIOSH Status: None

Escape Hood Type: APER—particulate filter surrounds military-grade activated charcoal; 30 min duration

Unit Cost: \$100

Component Cost: Not specified

Other Certifications: European Conformance Standard CE-0158

European Norm (EN)149:2001 FFP3

European Norm (EN)403:1993 HCN

Manufacturing Standards DIN ISO 9001

Certified by DQS, a member of IQNET, The International Certification Network

Independent Testing: TNO Prins Maurits Laboratory, in the Netherlands

DMT Deutsch Montan Technologie GmbH, in Germany

Miller-Nelson Research Inc. Laboratory, in the U.S.A.

NC-Laboratory Spiez, the Swiss Defense Procurement Agency

Configuration: Not specified

Escape Hood Description: The Potomac® Emergency Escape Mask weighs under 226 g (0.5 lb) and fits in a pack, glove compartment, or on a belt in its optional carry case. Each mask is vacuum sealed into a foil pouch. Two particulate filters surround military-grade activated charcoal, protecting against anthrax, cyanide, sarin, smallpox, ammonia, chlorine, smoke, and more. The filters permit high-volume airflow, enabling heavy breathing during an emergency. The Potomac goes on quickly and creates an instant seal. No fit test is needed. First Responders wearing the bright yellow mask are easily identifiable. Masks are available in black for tactical use. The Potomac® Emergency is donned in less than 6 s—no caps to remove or filter canisters to screw in; is designed for breathing under heavy exertion and stress conditions; and has a silicone, facial-conforming mask body that provides excellent seal with no fit test needed.

Escape Hood Application: The POTOMAC® Emergency Escape Mask was designed to provide certified protection for biological and chemical terror threats—including anthrax, cyanide, sarin, and smallpox—by Helsatech® of Germany, a manufacturer of nuclear, biological, and chemical defense products for military and civilian use

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: Not specified

Protection Categories: Not specified

Duration Rating: 30 min

Operational Limitations: Not specified

Design: Full-facepiece tight fitting. Double lens (2 optically clear lenses with anti-fogging coating).

DESIGN/CONFIGURATION

Escape Respirator Type: APER—particulate filter surrounds military-grade activated charcoal

Configuration: Full-facepiece tight fitting. Double lens (2 optically clear lenses with anti-fogging coating).

HUMAN FACTORS

Communication: Speech and hearing are not impaired when wearing the mask

Weight: 220 g (7.76 oz)

Don/Doff Information: 6 s

Sizes Available: One size fits all

LOGISTICS

Maintenance Required: Not specified

Storage Conditions: -30 °C to 45 °C (-22 °F to 113 °F). Avoid exposing the bag to direct sunlight.

Storage Life: Not specified

Disposal: Cannot be cleaned and reused. No procedures to decontaminate/dispose of used equipment.

Use/Reuse: Cannot be cleaned and reused. No procedures to decontaminate/dispose of used equipment.

Training: No fit testing required

Manuals: Not specified

Color: Yellow; black for government agencies

Package Shape/Volume: 155 mm x 79 mm x 57 mm (6.1 in x 3.1 in x 2.5 in). Packaging is lamination of aluminum foil, polyamide and polyethylene. Fits into a pack or glove compartment.

Health Hazards and Safety: No health hazards

MSDS: Not specified

Warranty: Not specified

GENERAL

Quick Protective Systems Quick2000®**Model:** Quick2000 (to be superseded by Quick15)

Quick Protective Systems Inc. (QPS)
 P.O. Box 1409
 Stuart, Florida 34995-1409
 Todd Resnick
 772-781-7723 (Tel)
<http://www.quickmask.com/features.htm>
<http://www1.rkb.mipt.org/>
 Responder Knowledge Database

Vendor Status: The vendor has not responded
Availability: Usually ships in 5 to 7 business d. Only military sales through Quick Protective Systems, Inc. All others through distributor.

**NIOSH Status:** None

Escape Hood Type: APER—CB filter; >30 min duration. The high performance filter contains military grade carbon to absorb chemical gases and HEPA grade media to remove biological particles.

Unit Cost: \$125

Component Cost: \$200 with hard case
 \$50 training hood

Other Certifications: Not specified

Independent Testing: U.S. Army Soldier Biological Chemical Command (SBCCOM)
 Edgewood Chemical Biological Center (ECBC)

Meets and/or exceeds the CBEHR standard created by SBCCOM

Configuration: Not specified

Escape Hood Description: The Quick2000® is a one-size-fits-all NBC Escape Hood Respirator that provides rapid protection against CB agents. It is comprised of a chemical protective hood with integrated neck dam, chem-bio filter, mouthpiece, and visor. The spacious hood covers the entire head and seals at the neck by means of a neck dam that automatically adjust to fit necks from 25 cm to 56 cm (10 in to 22 in) circumference. The high performance filter contains military grade carbon to absorb chemical gases and HEPA grade media to remove biological particles. Breathing is accomplished by means of a “snorkel type” mouthpiece inside the hood. A nose clip to prevent inhaling or exhaling through the nose is integrated into the hood by means of a flexible boot. It is easily placed on the nose and adjusted by means of short tabs that extend outside of the hood. The large, anti-fog visor provides excellent outward and peripheral vision. The Quick2000® has a high capacity filter, a vapor-tight hood, and a high respiratory protection factor (PF). These features combine to provide the wearer with excellent head, eye, and respiratory protection. The Quick2000® is a universal fit device, which simplifies inventory management, eliminates the need to match a specific respirator size to a specific individual, and eliminates the need for fit testing. A silicone mouthpiece provides a universal fit and a gas-tight breathing interface. Unlike a nosecup, the integrity of the mouthpiece seal is completely unaffected by face size, face shape, or facial hair. The Quick2000® is comprised of a chemical resistant hood with integrated visor, mouthpiece, neck dam, and filter cartridge. The Quick2000® hood covers the entire head and is made from a proprietary chemical protective fabric. The interior is spacious and can accommodate large head sizes, a full head of hair and eyeglasses. The visor is designed to protect the eyes and provide excellent outward and peripheral vision day or night. The large visor has a permanent anti-fog coating on a crystal clear polyester chemical resistant material. An externally actuated nose clip is provided to obstruct nasal breathing during use. The nose clip is integrated into the visor by means of a flexible rubber boot that moves freely in all directions and is externally actuated and easily adjustable at any time. The elastic neck dam, made of neoprene rubber, seals the external environment from the hood interior. The neck dam automatically adjusts to fit necks from 10 in to 22 in circumference. The approach of sealing against the neck instead of the face provides a superior seal against toxic air. This also eliminates serious problems with poor facial fit, sizing, facial hair, tangled straps, and interference with long hair. The wearer is able to breathe by means of a snorkel type soft silicone mouthpiece, which is sealed through the front of the hood and attached to the high performance filter system. The mouthpiece provides a universal fit and a very high protection factor and is comfortable to use, even for extended periods of time. The mouthpiece is easily released to allow verbal communication between breaths.

Escape Hood Application: CB agents

References: Defense Intelligence Agency; FEMA; National Institute of Health; U.S. Air Force; U.S. Army; U.S. Capitol Police; U.S. Customs Service; U.S. Department of Energy; U.S. District Court; U.S. Marine Corps; U.S. Marshall's Service; U.S. Navy; U.S. Supreme Court Police; U.S. State Department (Embassy Personnel); DoD Pentagon Staff (military and civilian personnel); City of Alexandria, Virginia; City of Vernon, California; Dane County Emergency Management; Fairfax County Virginia; King County Emergency Management; King County Medic One; Los Angeles Airport Police Metropolitan Boston Transit Authority Police (MBTA); New Jersey Transit Police; and Port Authority of New York, New Jersey, and Washington D.C. Metropolitan Transit Authority (Metro and SuBAy System)

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: High capacity filter: filter cartridge is packed with military grade ASZM-TEDA carbon. A HEPA filter is sealed to the front of the cartridge. This high performance filtration system provides protection against a wide range of deadly aerosols (such as biologicals) and gases (including CAs). The filter cartridge is positioned in front of and below the wearer's mouth.

Protection Categories: Unique mouthpiece design. Delivers protection factors significantly higher than traditional half mask/neck seal designs. Protection Factor (PF) 50 000*

Duration Rating: Greater than 30 min

Operational Limitations: Not specified

Design: Vision: Extra large visor reduces chances of claustrophobia. Visor features a permanent anti-fog coating, providing wearer with a wide and clear outward view.

Oversized hood: Covers entire head, and allows for full head of hair, facial hair and eyeglasses.

Nose clip: Externally actuated, the nose clip is designed to prevent nasal breathing during use, ensuring that the seal is maintained at the mouth.

Neck dam: Elastomeric rubber seals off external environment from inside the hood, adapting to neck sizes from 10 in to 22 in

DESIGN/CONFIGURATION

Escape Respirator Type: APER—CB filter

Configuration: Vision: Extra large visor reduces chances of claustrophobia. Visor features a permanent anti-fog coating, providing wearer with a wide and clear outward view.

Oversized hood: Covers entire head, and allows for full head of hair, facial hair and eyeglasses.

Nose clip: Externally actuated, the nose clip is designed to prevent nasal breathing during use, ensuring that the seal is maintained at the mouth.

Neck dam: Elastomeric rubber seals off external environment from inside the hood, adapting to neck sizes from 10 in to 22 in

HUMAN FACTORS

Communication: Mouthpiece can be released to speak loudly and clearly. The training video provides detailed instructions.

Weight: 397 g (14 oz)

Don/Dooff Information: 0 s to 10 s; no assistance needed

Sizes Available: One size fits all. The "One Size Fits All" feature greatly simplifies the logistics of providing immediate chem-bio protection to adults and children without the problems of mask fitting, straps, facial hair, long hair, eyeglasses, hearing aids, and difficult to fit bone structure.

LOGISTICS

Maintenance Required: Visual inspection

Storage Conditions: 0 °C to 54 °C (32 °F to 130 °F)

Storage Life: Individually packaged and sealed in a nonreusable vacuum packed bag and has a 4 yr shelf life

Disposal: Cannot be cleaned and reused. Minimal waste disposal burden. The Quick2000® is a one time use disposable device, eliminating the costs associated with fit testing, maintenance, and decontamination.

Use/Reuse: Cannot be cleaned and reused. Minimal waste disposal burden. The Quick2000® is a one time use disposable device, eliminating the costs associated with fit testing, maintenance, and decontamination.

Training: Training unit and video: The Quick2000 training device (sold separately) is recommended as part of your emergency preparedness planning. A training video (VHS or CD-ROM) is also available to adequately prepare you in case of an emergency and costs \$25.

Manuals: Manual

Color: 1 color is available

Package Shape/Volume: 6.35 cm x 10.16 cm x 22.86 cm (2.5 in x 4 in x 9 in) package size. Less than or equal to 0.014 m³ (0.5 ft³). Flexible, nonrigid packaging. Versatile soft carry pouch: Lightweight and compact, the Quick2000 snaps to any belt to be worn on the waist for instant access and protection. Its compact design allows it to be easily stored. An optional hard case is also available for added storage protection.

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: Not specified

GENERAL

Quick Protective Systems QuickPro®**Model:** QuickPro (Professional); JSCESM (Military)

Quick Protective Systems Inc. (QPS)
 P.O. Box 1409
 Stuart, Florida 34995-1409
 Todd Resnick
 772-781-7723 (Tel)
<http://www.quick-gear.com/>
<http://www1.rkb.mipt.org/>
 Responder Knowledge Database

**Vendor Status:** The vendor has not responded**NIOSH Status:** None**Escape Hood Type:** APER—ASZM-TEDA carbon filter; >30 min duration**Unit Cost:** \$130**Component Cost:** Not specified**Other Certifications:** Not specified**Independent Testing:** U.S. Army Soldier Biological Chemical Command (SBCCOM); agents tested: CK, HD, GB**Configuration:** Not specified

Escape Hood Description: At the request of the professional community, the QuickPro® was developed to better meet their needs. The QuickPro® has been extensively tested by the ECBC at the Aberdeen Proving Grounds. With its competitive pricing and performance, it is without a doubt the best choice for extended professional self-protection. The QuickPro® is a one time use emergency hood for military, police, fire, and emergency personnel who may find themselves, without warning, in a toxic environment. The design was developed to provide the user with a compact easily donned escape hood that provides the complete protection of the head, verbal communication capability, and the ability provide hydration. The neck dam feature of the hood is the key to the QuickPro® one-size-fits-all total head protection. It uses two simple to use straps to ensure a protective for neck sizes of 25 cm to 56 cm (10 in to 22 in). The QuickPro® is a single use device which must be discarded in a safe manner immediately after use. The QuickPro® provides head, eye, and respiratory protection from NBC agents and fallout. The hood is comprised of a chemical resistant hood with integrated visor, mouthpiece, and neck dam. It is made of Zytron 300®, a proprietary multi-layer chemical barrier fabric. The visor is made of clear polyester and provides the wearer with a wide field of view with interior anti-fogging coating. The elastic neck dam is made of neoprene rubber that seals the external environment from the hood interior. The wearer is able to breath by means of the patented Omni-Fit® nose cup which provides a superior fit and allows clear and consistent verbal communications. The cartridge is packed with more ASZM-TEDA carbon than the C2A1 filter cartridge allowing for protection in extended NBC escape situations. The entire system is water repellent so it can be worn during decontamination.

Escape Hood Application: NBC agents and fallout

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: CA, BA, TIC/TIM, and radiological**Protection Categories:** Not specified**Duration Rating:** Greater than 30 min**Operational Limitations:** Not specified**Design:** Hooded with neck dam. Single lens; polyester, permanent anti-fog coating inside.

DESIGN/CONFIGURATION

Escape Respirator Type: APER—ASZM-TEDA carbon filter**Configuration:** Hooded with neck dam. Single lens; polyester, permanent anti-fog coating inside.

HUMAN FACTORS

Communication: The Omni-Fit® nose cup provides a superior fit with clear and consistent verbal communications ability**Weight:** Package weight: 454 g (1 lb)

Don/Doff Information: 6 s; no assistance needed

Sizes Available: One size fits all

LOGISTICS

Maintenance Required: Single use device which must be discarded in a safe manner immediately after use

Storage Conditions: 0 °C to 54 °C (32 °F to 130 °F)

Storage Life: 4 yr in original packaging

Disposal: Single use device which must be discarded in a safe manner immediately after use

Use/Reuse: Single use device which must be discarded in a safe manner immediately after use

Training: The QuickPro® training hood is physically identical to the operational escape hood, but it does not provide any protection. The training hood is strongly suggested for becoming familiar with the hood donning process. It is especially important for young people, elderly, or others that might benefit with being able to get hands-on practice and familiarization. The training hood disassembles for cleaning so that it can be reused repeatedly for training purposes. The hood folds up with a training manual into a zip-lock plastic pouch. The Survivair QuickPro® training video provides useful information in the donning and use of the escape hood. It is suitable for showing to larger audiences as part of an initial training or refresher training program.

Manuals: Not specified

Color: 1 color available

Package Shape/Volume: 19.69 cm x 12.07 cm x 9.53 cm (7.75 in x 4.75 in x 3.75 in); 0.002 m³ (0.08 ft³)

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: Not specified

GENERAL

SafetyTech Chemihood**Model:** Discontinued Item

SafetyTech International, Inc.
 5703 Industry Lane
 Frederick, Maryland 21704
 888-744-6462 (Tel)
 301-624-5000 (Tel)
 301-624-5688 (Fax)
 sales@safetytechint.com
 http://www.safetytechint.com

**Vendor Status:** The vendor has not responded**NIOSH Status:** None**Escape Hood Type:** APER**Unit Cost:** \$180**Component Cost:** Not specified**Other Certifications:** Not specified**Independent Testing:** Not specified**Configuration:** Not specified

Escape Hood Description: The SafetyTech ChemiHood is a protective hood for self-rescue that provides effective respiratory protection against NBC hazards; it is suitable for use in chemical accidents such as in HAZMAT transport and within the chemical or nuclear industries. The ChemiHood material is resistant to CAs and caustic gases, e.g., hydrogen chloride, hydrogen fluoride, and organics. It is made of a flexible laminate, integrated with a large polycarbonate visor that has a lateral field of vision of 75 %. The elastometric collar, which automatically seals around the neck, in conjunction with the internal oral/nasal half mask prevents leakage. The ChemiHood is easy to don and use because of the self-adjusting strap and can be used with personal eye glasses.

Escape Hood Application: Not specified

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: Not specified**Protection Categories:** Not specified**Duration Rating:** Not specified**Operational Limitations:** Not specified**Design:** Not specified

DESIGN/CONFIGURATION

Escape Respirator Type: APER**Configuration:** Not specified

HUMAN FACTORS

Communication: Not specified**Weight:** 400 g (14 oz)**Don/Dooff Information:** Between 20 s and 30 s**Sizes Available:** One size fits all

LOGISTICS

Maintenance Required: Not specified**Disposal:** Not specified**Storage Conditions:** Not specified**Storage Life:** >10 yr**Training:** Not specified**Manuals:** Not specified**Use/Reuse:** Not specified**Package Shape/Volume:** Not specified**Health Hazards and Safety:** Not specified**MSDS:** Not specified**Color:** Not specified**Warranty:** Not specified

GENERAL

Scott SCRAM® Escape Respirator

Model: SCRAM

Scott Health and Safety
309 West Croweel Street
Monroe, NC 28112
800-633-3915 (Tel)
704-282-8423 (Fax)
hssales@scotthealthsafety.com
<http://www.scotthealthsafety.com>
<http://www1.rkb.mipt.org/>
Responder Knowledge Database

Vendor Status: The vendor has not responded



NIOSH Status: TC-13F-88 (basic 42 CFR 84 approval)

Escape Hood Type: APER—at least 30 min duration

Unit Cost: \$302

Component Cost: Not specified

Other Certifications: Not specified

Independent Testing: Not specified

Configuration: Not specified

Escape Hood Description: The SCRAM is a semi-closed circuit emergency escape breathing device (EEBD) that provides 15 min of protection against liquid and vapor chemicals, as well as biological contaminants. The SCRAM® is NIOSH approved for escape from emergency situations, including IDLH environments. Unlike most escape respirators, the SCRAM is a 15 min oxygen generating respirator with a Venturi nozzle that pulls hood gas through a CO₂ scrubber. The escape respirator is a lightweight hood design, to accommodate glasses and facial hair, that can be donned easily in confined spaces.

Escape Hood Application: Not specified

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: Not specified

Protection Categories: Not specified

Duration Rating: At least 30 min

Operational Limitations: Not specified

Design: Not specified

DESIGN/CONFIGURATION

Escape Respirator Type: APER

Configuration: Not specified

HUMAN FACTORS

Communication: Not specified

Weight: 1.59 kg (3.5 lb)

Don/Doff Information: Less than 10 s

Sizes Available: One size fits all

LOGISTICS

Maintenance Required: \$32 to replace filter every 5 yr

Storage Conditions: Not specified

Storage Life: >15 yr

Disposal: Not specified

Training: Not specified

Manuals: Not specified

Use/Reuse: Not specified

Color: 1 color available

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: Not specified

Package Shape/Volume: Between 0.001 m³ and 0.003 m³ (0.05 ft³ and 0.10 ft³)

GENERAL

SWEDE NBC Escape Hood

Model: Adult: TST311-720207F; Child: TST311-720207FB4

First Line Technology
P.O. Box 58111
Washington, District of Columbia 20037
Amit Kapoor
866-556-0517 (Tel)
202-249-8480 (Tel)
202-318-8480 (Fax)
akapoor@firstlinetech.com
<http://www.firstlinetech.com>
<http://www1.rkb.mipt.org/>
Responder Knowledge Database



Vendor Status: The vendor has responded
Availability: In stock, and manufactured on demand.
For higher quantities, a lead time will be necessary.
Please contact vendor.

NIOSH Status: None

Escape Hood Type: APER—60 min duration

Unit Cost: \$175
Filter PEK Hood A2B2E2K2-P3—\$32

Component Cost: Filter PEK Hood A2B2E2K2-P3—\$32

Other Certifications: EN

Independent Testing: EN 403 (system's inward leakage), EN 143 (respirator particle filters), and EN 141 (respiratory gas and combined filters)

Configuration: Not specified

Escape Hood Description: The NBC Escape hood by SWEDE is a civilian APR ideal for protecting people and first responders who may unexpectedly find themselves in a contaminated environment. Its easy to use design is comfortable to wear and is easily put on in seconds. It comes with its own carrying bag with belt loops and shoulder straps for easy transportability. The NBC Escape Hood is easy to carry and conceal. Weighing less than 907 g (2 lb) makes it easy to store in a trunk, desk, or to Velcro to a wall. The Tyvek F material, sealed seams, and interchangeable NBC filter provide excellent chemical resistance to all known CBs for up to 60 min of respiratory protection.

Escape Hood Application: Radiation, and biological

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: CA, BA, TIC/TIM, and radiological

Protection Categories: Not specified

Duration Rating: 60 min

Operational Limitations: Manufacturer provides specific guidance for use in high heat and humidity. Guidance for use in <19.5 % oxygen concentration.

Design: Hooded with neck dam. Single lens; flexible; PVC visor with coatings.

DESIGN/CONFIGURATION

Escape Respirator Type: APER

Configuration: Hooded with neck dam. Single lens; flexible; PVC visor with coatings.

HUMAN FACTORS

Communication: No communications interface capability

Weight: Hood without filter 0.23 kg (0.5 lb), filter 0.45 kg (1 lb), total weight 0.68 kg (1.5 lb)

Don/Dooff Information: 0 s to 10 s; no assistance needed

Sizes Available: One size fits all

LOGISTICS

Maintenance Required: No regular maintenance. \$32 to replace filter every 5 yr.

Storage Conditions: The NBC Escape Hood has a 15 yr shelf life but the filters must be replaced every 5 yr or after the vacuum seal is broken

Storage Life: >5 yr

Disposal: Can be cleaned and reused. Procedures are available to decontaminate/dispose of used equipment.

Use/Reuse: Can be cleaned and reused. Procedures are available to decontaminate/dispose of used equipment.

Training: No training required. Written respiratory protection program; no fit-testing required.

Manuals: Training manual

Color: Color coding is available; minimum order for custom colors is 200

Package Shape/Volume: Less than or equal to 0.014 m³ (0.5 ft³); soft sided pouch; vacuum packed

Health Hazards and Safety: No latex

MSDS: MSDS is available

Warranty: 1 yr limited warranty

GENERAL**The SEA Group SR 77 WMD Escape Hood****Model:** 50061

Safety Equipment America (The SEA Group)
 11 Business Park Drive
 Branford, Connecticut 06405
 Bengt Kjellberg
 888-732-3500 (Tel)
 203-483-9483 (Tel)
 203-483-6633 (Fax)
 bengtk@sea.com.au
 http://www.sea.com.au

Vendor Status: The vendor has responded**Availability:** In stock**NIOSH Status:** None

Escape Hood Type: APER—15 min, 30 min, 45 min, and 60 min; filter efficiency with paraffin oil >99.99 %. NIOSH CBRN with “Chemical” specific and with carbon monoxide.

Unit Cost: \$302**Component Cost:** U.S. \$ 301.82**Other Certifications:** Approved according to EN 403:1993 (European Smoke escape hood standard)**Independent Testing:** Not specified**Configuration:** SR 77 WMD Escape Hood With Pouch—50061

Escape Hood Description: SR 77 WMD Escape Hood With Pouch (50061) is a combined smoke/escape hood for NBC (nuclear biological, chemical) warfare agents, fire, smoke, toxic gases, particles, and industrial chemicals

Escape Hood Application: Flammable environment, explosive atmospheres, radiation, and biological

References: New Your State Emergency Management. 2000 units in use for 3 yr. Contact John Gibb at 518-485-9169.

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: CA, BA, TIC/TIM, and radiological. NIOSH CBRN with “Chemical” Specific and with carbon monoxide.

Protection Categories: Carbon monoxide (CO): 0.25 % to 0.50 %—30 min; 0.5 % to 0.75%—35 min (30 min/35 min)

Acrolein (C₃H₄O): 30 min *

Hydrogen chloride (HCL): 90 min*

Hydrogen cyanide (HCN): 45 min*

Ammonia: 1000 ppm—>45 min; 5000 ppm—>20 min (45min/20 min)

Chlorine: 1000 ppm—>45 min

Cyclohexane: 1000 ppm—>50 min

Sulfur dioxide: 1000 ppm—>80 min

Sarin (GB): 1000 mg/m³—>30 min

* Test interrupted—no breakthrough could be detected

Duration Rating: 15 min, 30 min, 45 min, and 60 min

See tests below at 50 L/min constant flow through cartridge. Filter efficiency paraffin oil >99.99 %.

Operational Limitations: No specific guidance for use in high heat and humidity. Guidance for use in <19.5 % oxygen concentration.

Design: Hooded with neck dam—½ mask silicone inside hood with neck dam for low dead air space. Single lens; flexible; visor contains coatings to reduce fogging.

DESIGN/CONFIGURATION**Escape Respirator Type:** APER

Configuration: Hooded with neck dam—½ mask silicone inside hood with neck dam for low dead air space. Single lens; flexible; visor contains coatings to reduce fogging.

HUMAN FACTORS

Communication: No communications interface capability. Escape only hood not intended to stop and talk or assist other in escape. Can be equipped with voice amplification system on special request.

Weight: 0.6 kg (1.32 lb)

Don/Dooff Information: 0 s to 10 s; no assistance needed

Sizes Available: Small, medium

LOGISTICS

Maintenance Required: Change of filter every 7.5 yr. Cost first 7.5 yr is \$40.25 per year. After 7.5 yr, change filter every 7.5 yr at an estimated cost of \$100 for filter change and repacking of hood in vacuum sealed bag. Average cost of escape hood after the first 7.5 yr is \$13.33 per yr.

Storage Conditions: 10 °C to 93 °C (50 °F to 200 °F); 100 % rh. The Escape hood can be stored below 10 °C (50 °F) but the conversion from CO to CO₂ will not start in temperature below 10 °C (50 °F).

Storage Life: 7.5 yr between cartridges change. Unopened hood will last 7.5 yr, after which it can be fitted with fresh filters every 7.5 yr.

Disposal: Cannot be cleaned and reused. No procedures to decontaminate/dispose of used equipment.

Use/Reuse: Cannot be cleaned and reused. No procedures to decontaminate/dispose of used equipment.

Training: No training required. Written respiratory protection program; no fit-testing required. Video or DVD training is available on our website or separately.

Manuals: Manual and video disk can be sent at no charge if requested by customer

Color: No color coding available. Comes standard in bright yellow color.

Package Shape/Volume: 0.0024 m³ (0.086 ft³); 120 mm x 120 mm x 170 mm (4.72 in x 4.72 in x 6.69 in)

Health Hazards and Safety: No latex

MSDS: MSDS is available

Warranty: 1 yr standard warranty; 15 yr on hood material in unopened vacuum sealed bag.

GENERAL

Essex PB&R Victim Rescue Unit+

Model: VRU+

Essex PB&R
8007 Chivvis Drive
Saint Louis, Missouri 63123
800-296-7587 (Tel)
314-351-6116 (Tel)
314-351-7181 (Fax)
<http://www.smokehoods.com>



Vendor Status: The vendor has not responded

NIOSH Status: None

Escape Hood Type: EEBA—at least 30 min duration

Unit Cost: \$839

Component Cost: Not specified

Other Certifications: Not specified

Independent Testing: Not specified

Configuration: Not specified

Escape Hood Description: The Essex PB&R VRU+ is a self-contained closed circuit rebreather system intended for trained individuals in rescue and escape situations from CBs, fire, smoke, and toxic fumes. Oxygen (flow is begun by semi-automatic activation) flows into the hood and is breathed and rebreathed by the user. The hood is a one size fits most, dons and doffs in seconds, and offers up to 60 min protection, depending on the situation and location of the user. The system allows two-way communication and 360° visibility. Training units are available and on-line product manuals and information updates are available. The VRU+ is folded and sealed inside a multi-laminate pouch, which can be packaged a variety of ways, including inside a fire resistant container. In addition, the VRU+ can be easily stored or mounted for industrial settings and can be donned in the near zero visibility atmosphere that may accompany a fire.

Escape Hood Application: Not specified

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: Not specified

Hazardous Threat Categories: Between 20 s and 30 s

Protection Categories: Not specified

Duration Rating: At least 30 min

Operational Limitations: Not specified

Design: Not specified

DESIGN/CONFIGURATION

Escape Respirator Type: EEBA—SCBA

Configuration: Not specified

HUMAN FACTORS

Communication: Allows two-way communication

Weight: 0.68 (kg) 1.5 lb

Don/Doff Information: Less than 20 s

Sizes Available: One size fits all

LOGISTICS

Maintenance Required: Not specified

Storage Conditions: - 29 °C to 85 °C (-20 °F to 185 °F)

Storage Life: 10 yr

Disposal: Not specified

Use/Reuse: Not specified

Color: Not specified

Training: Not specified

Manuals: Not specified

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: 10 yr from date of manufacture

Package Shape/Volume: 19.05 cm x 24.13 cm x 5.08 cm (7.5 in x 9.5 in x 2 in); 0.002 m³ (0.08 ft³)

GENERAL

Interspiro Spiroscape Escape SCBA with Hood

Model: Spiroscape 10 min (3000 psi) 95300-11; Spiroscape 15 min (3000 psi) 95300-12;
Spiroscape fill Adapter (3000 psi) 95460-04

Interspiro
31 Business Park Drive
Branford, Connecticut 06405
Mike Brookman
203-481-3899 (Tel)
203-843-0757 (Cell)
SCBAdesk@interspiro-us.com
http://www.interspiro-us.com/library/productcatalog.nologo/pages/96998-01_54.htm



Vendor Status: The vendor has not responded

NIOSH Status: TC-13F-485 (basic 42 CFR 84 approval)

Escape Hood Type: EEBA—10 min or 15 min duration

Unit Cost: \$500

Component Cost: Not specified

Other Certifications: NIOSH approved 10 min or 15 min constant flow escape SCBA with hood

Independent Testing: Not specified

Configuration: Not specified

Escape Hood Description: The Spiroscape air delivery system features an inner mask with exhalation valve and air supply tube that allows carbon dioxide to be expelled from the hood, optimizing the use of fresh air from the cylinder without the need for a demand valve. This unique constant flow system assures a predictable duration for air delivery. The patented auto hatch/safety valve automatically opens if air supply is exhausted to prevent employee suffocation and can be used as standby fresh air hatch in staging areas. The auto hatch/safety valve also eliminates the need for a separate low air alarm system. The quick start pull tab guarantees automatic air activation prior to donning hood, which simplifies the start up procedure in a time critical emergency.

Escape Hood Application: An escape breathing apparatus for nonfirefighting individuals in hazardous environments

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: Not specified

Hazardous Threat Categories: Between 20 s and 30 s

Protection Categories: Not specified

Duration Rating: Not specified

Operational Limitations: Not specified

Design: Not specified

DESIGN/CONFIGURATION

Escape Respirator Type: EEBA—SCBA

Configuration: Not specified

HUMAN FACTORS

Communication: Not specified

Don/Doff Information: Between 20 s and 30 s

Weight: Not specified

Sizes Available: Not specified

LOGISTICS

Maintenance Required: Not specified

Storage Conditions: Not specified

Disposal: Not specified

Storage Life: Not specified

Training: Not specified

Manuals: Not specified

Use/Reuse: Not specified

Color: Not specified

Package Shape/Volume: Not specified

Health Hazards and Safety: Not specified

Warranty: Not specified

MSDS: Not specified

GENERAL

ISI Emergency Escape Breathing Apparatus**Model:** CEEBA 5; CEEBA 10

International Safety Instruments
 922 Hurricane Shoals Road
 Lawrenceville, GA 30043
 Mark Williamson
 888-474-7233 (Tel)
 770-963-2797 (Fax)
 markw@intsafety.com
 http://www.intsafety.com
 http://www1.rkb.mipt.org/
 Responder Knowledge Database



PRODUCT SHEET

Vendor Status: The vendor has not responded**NIOSH Status:** TC-13F-525 (basic 42 CFR 84 approval)**Escape Hood Type:** EEBA—5 min or 10 min**Unit Cost:** \$710**Component Cost:** Not specified**Other Certifications:** Not specified**Independent Testing:** Not specified**Configuration:** Not specified

Escape Hood Description: ISI Emergency Escape Breathing Apparatus (CEEBA) is NIOSH approved as an escape device from atmospheres that have suddenly become IDLH. It is easy to don, allowing the wearer to begin escape in just seconds. The CEEBA is available in two versions, the 5 min (CEEBA 5) or 10 min (CEEBA 10) cylinder. CEEBA 5 cylinders are 2216 psi, and CEEBA 10 cylinders are 3000 psi. The CEEBA is equipped with a compact demand valve (CDV) allowing air on demand instead of a constant flow rate of 40 lpm.

Escape Hood Application: Not specified

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: Not specified**Protection Categories:** Not specified**Duration Rating:** CEEBA 5—5 min; CEEBA 10—10 min**Operational Limitations:** Not specified**Design:** Not specified

DESIGN/CONFIGURATION

Escape Respirator Type: EEBA—SCBA**Configuration:** Not specified

HUMAN FACTORS

Communication: Not specified**Don/DoFF Information:** Between 20 s and 30 s to don**Weight:** CEEBA 5—7 lb; CEEBA 10—10.5 lb**Sizes Available:** CEEBA 5—available in small and medium; CEEBA 10—available in large and extra large

LOGISTICS

Maintenance Required: Not specified**Storage Conditions:** Not specified**Disposal:** Not specified**Storage Life:** 5 yr**Training:** Not specified**Manuals:** Not specified**Use/Reuse:** Not specified**Color:** 1 color available**MSDS:** Not specified**Warranty:** Not specified**Health Hazards and Safety:** Not specified**Package Shape/Volume:** Between 0.003 m³ and 0.03 m³ (0.1 ft³ and 1 ft³)

GENERAL

ISI Emergency Escape Breathing Apparatus**Model:** EEBA 5; EEBA 10

International Safety Instruments
 922 Hurricane Shoals Road
 Lawrenceville, GA 30043
 Mark Williamson
 888-474-7233 (Tel)
 770-963-2797 (Fax)
 markw@intsafety.com
<http://www.intsafety.com/eeba.html>
<http://www1.rkb.mipt.org/>
 Responder Knowledge Database

Vendor Status: The vendor has not responded

PRODUCT SHEET

NIOSH Status: TC-13F-470—EEBA 5 (basic 42 CFR 84 approval); TC-13F-471—EEBA 10 (basic 42 CFR 84 approval)**Escape Hood Type:** EEBA 5—5 min, 2216 psi; EEBA 10—10 min, 3000 psi**Unit Cost:** \$447**Component Cost:** Not specified**Other Certifications:** Not specified**Independent Testing:** Not specified**Configuration:** Not specified

Escape Hood Description: The pouch can be carried around the waist, neck, or over the shoulder. The clear hood allows full peripheral vision and protection even if the wearer has glasses, facial hair, or long hair. The unit is totally self-contained inside the bright carrying pouch which can be stored in work areas or carried around the waist, around the neck, or over the shoulder.

Regulator: EEBA 5 and 10 (corrosion-resistant, nickel-plated brass regulator)

Cylinder type—EEBA 5 and 10 (lightweight aluminum)

Hood material—EEBA 5 and 10 (flame retardant, clear PVC with optional polyurethane hood for colder temperatures)

Pouch material—EEBA 5 and 10 (chemical and oil resistant PVC with nylon reinforcement)

Carrying case—EEBA 5 and 10 (injection-molded plastic)

Flow rate (initial)—EEBA 5 (36 lpm to 39 lpm); EEBA 10 (36 lpm to 39 lpm)

Cylinder pressure—EEBA 5 (2216 psi); EEBA 10 (3000 psi)

Escape Hood Application: The ISI EEBA provides respiratory protection for escape from atmospheres that have suddenly become Immediately Dangerous to Life or Health (IDLH). Confined space, chemical plants, petroleum plants, construction, agriculture, government, aviation and aerospace, and government.

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: Not specified**Protection Categories:** Not specified**Duration Rating:** EEBA 5—5 min, 2216 psi; EEBA 10—10 min, 3000 psi**Operational Limitations:** 5 min or 10 min

Design: The pouch can be carried around the waist, neck, or over the shoulder. The clear hood allows full peripheral vision and protection even if the wearer has glasses, facial hair or long hair. The unit is totally self-contained inside the bright carrying pouch which can be stored in work areas or carried around the waist, around the neck, or over the shoulder. Chose from either a PVC hood chemical resistance or a polyurethane hood for cold weather operations. A hard shell carrying case is available, which can be mounted to a wall. NIOSH approved.

DESIGN/CONFIGURATION

Escape Respirator Type: EEBA—SCBA

Configuration: The pouch can be carried around the waist, neck, or over the shoulder. The clear hood allows full peripheral vision and protection even if the wearer has glasses, facial hair or long hair. The unit is totally self-contained inside the bright carrying pouch which can be stored in work areas or carried around the waist, around the neck, or over the shoulder. Chose from

either a PVC hood chemical resistance or a polyurethane hood for cold weather operations. A hard shell carrying case is available, which can be mounted to a wall. NIOSH approved.

HUMAN FACTORS

Communication: Not specified

Weight: EEBA 5—6.75 lb; EEBA 10—10.25 lb

Don/Dooff Information: Between 20 s and 30 s. Open carrying pouch, turn the cylinder valve to the “ON” position, remove and don the hood, and egress to a safe environment.

Sizes Available: Not specified

LOGISTICS

Maintenance Required: Equipped with charging adapter with a standard CGA fitting so user can refill cylinder without removing or violating reducer/valve mechanism

Storage Conditions: Ambient

Storage Life: 5 yr

Disposal: Not specified

Use/Reuse: Not specified

Training: Easy to use. Instructions are printed clearly on the outside of the pouch for easy reference.

Manuals: Instructions are printed clearly on the outside of the pouch for easy reference

Color: Yellow pouch

Package Shape/Volume: Bright yellow pouch is convenient for carrying complete unit
EEBA 5—30 cm x 16.5 cm (12 in x 6.5 in); EEBA 10—33 cm x 20 cm (13 in x 8 in)

Health Hazards and Safety: Not specified

MSDS: Not specified

Warranty: Not specified

GENERAL

North Emergency Escape Breathing Apparatus (EEBA)**Model:** 845 (5 min 42 lpm), 850 (10 min 42 lpm), 855 (5 min, 75 lpm)

North Safety Products
 2000 Plainfield Pike
 Cranston, Rhode Island 02921
 Lynn Aurelius
 858-722-1200 (Tel)
 401-943-4400 (Tel)
 401-275-2618 (Fax)
 Lynn.Aurelius@NorthSafety.com
 http://www.northsafety.com

Vendor Status: The vendor has not responded**NIOSH Status:** TC-13F-172, TC-13F-195, TC-13F-198**Escape Hood Type:** EEBA—SCBA**Unit Cost:** \$500**Component Cost:** Not specified**Other Certifications:** NIOSH/MSHA certified**Independent Testing:** Not specified**Configuration:** Deflector blows incoming air onto the lens to minimize fogging.

Transparent polyurethane hood—Good, all-around visibility. Safe to use.

Hood is detachable—Replaceable for easy maintenance and cleaning.

Secure neck seal—Provides an effective fit.

Refillable aluminum cylinders—Lightweight. Reusable system can be refilled. No need for high pressure charging system.

Cylinders are DOT approved—In compliance with regulations.

Pressure reducing valve—Simplified design reduces repair costs and maintenance. Greater comfort, with more air for high stress conditions. Reduces fogging.

On/off valve with pressure gauge—Simple to use. Can test for go/no-go condition. Easy to check air cylinder pressure.

High visibility carrying bag—Can be located rapidly in smoke conditions. Versatile carrying strap system.

Escape Hood Description: North offers three models of EEBA's in 5 min and 10 min units. Model 845 provides an average of 42 lpm of airflow for 5 min and the 850 provides a 42 lpm for 10 min. The Model 855 provides a higher average flow, 75 lpm, for 5 min, which is ideal where escape routes require high levels of exertion. The 855 also features a unique diffuser/muffler system to reduce noise inside the hood. The lightweight cylinders are refillable, while the hoods can be detached for cleaning or replacement.

Escape Hood Application: Chemical, petrochemical, laboratories, and paper mills

OPERATIONAL CAPABILITIES

Hazardous Threat Categories: Not specified**Protection Categories:** Not specified**Duration Rating:** EEBA—5 min, 42 lpm; EEBA 10—10 min, 42 lpm**Operational Limitations:** Not specified**Design:** Not specified

DESIGN/CONFIGURATION

Escape Respirator Type: EEBA—SCBA**Configuration:** Not specified

HUMAN FACTORS

Communication: Not specified**Weight:** Not specified**Don/Dooff Information:** Pictorial user instructions on bag are easy to understand in an emergency situation

Sizes Available: One size fits all

LOGISTICS

Maintenance Required: Not specified

Storage Conditions: Durable and unaffected by low temperature to -18 °C (0 °F) for model 850, -30 °C (-25 °F) for model 845 and model 855

Disposal: Not specified

Storage Life: Not specified

Use/Reuse: Not specified

Color: Transparent hood. High visibility carrying bag and strap system can be easily be found in an emergency. Yellow carrying bag for the 5 min units and orange carrying bag for the 10 min EEBA.

Training: Not specified

Manuals: User instructions on bag. Easy to understand in an emergency situation. Always there when needed.

Package Shape/Volume: Not specified

Health Hazards and Safety: Not specified

Warranty: Not specified

MSDS: Not specified

